Antecedent Interventions: Investigating Social Stories and Visual Supports Interventions for Children At-risk for Emotional and Behavioral Disorders

By

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CHAPTER 1

INTRODUCTION

Children who exhibit problem behavior are at-risk for poor academic and social outcomes (Bulotsky-Shearer, Bell, Romero, & Carter, 2012; Crick et al., 2006). Attention, cooperation, peer relationships, achievement, engagement, and social skills are negatively associated with problem behavior in children (Dunlap et al., 2006; Fantazzo et al., 2005; Mashburn et al., 2008; Qi & Kaiser, 2003). The presence of disruptive behavior in preschool is associated with lower engagement (Harden et al., 2000; Olson & Huza, 1993) that may continue in kindergarten (Searle, Sawyer, Miller-Lewis, & Baghurst, 2014). Estimates of the number of children exhibiting problem behavior in early childhood have increased in the last decade from approximately 10% (Lavigne et al., 1996) to 15% (Eggers & Arnold, 2006), totaling around 5 million children (Powell, Fixsen, Dunlap, Smith, & Fox, 2007). About half of these children will continue to exhibit problem behavior if they do not receive intervention before K-12 schooling (Campbell, 1995).

Early intervention may provide children an opportunity to receive support in building the skills necessary to form meaningful relationships with others and engage in learning experiences (Hemmeter, Ostrosky, & Fox, 2006). Improving engagement in preschool may lead to increases in language and literacy outcomes (Vitiello & Williford, 2016), as well as outcomes in other academic content domains (Hofer, Farran, & Cummings, 2013). Although variability in children's levels of engagement typically occurs across the school day (Vitiello, Booren, Downer, & Williford, 2013), generally high levels of engagement are associated with gains in

achievement (Howes et al., 2008) and self-regulation (Williford et al., 2013). Furthermore, task engagement may mitigate the negative future academic outcomes associated with problem behavior for young children (McWayne & Cheung, 2009), thus decreasing the likelihood children are referred for special education services (Jeon et al., 2010).

Early intervention to support children's engagement in classroom activities is particularly important for children exhibiting persistent problem behavior, as these children are at-risk for disabilities such as emotional and behavioral disorders (EBD; Searle et al., 2014). Despite positive outcomes associated with early intervention, children identified as at-risk for disability have less access to early intervention services than those with identified developmental and physical disabilities (Fox, Dunlap, & Powell, 2002). Although problem behavior exhibited by children without disabilities may be less intense, the frequency of occurrence may be higher for children who do not have disabilities (Liaupsin, Jolivette, & Scott, 2004). The delay in accessing early intervention services may increase the likelihood problem behavior will increase in frequency and intensity during the early elementary years (Webster-Stratton & Reid, 2004).

Additionally, unlike children with developmental disabilities, preventative interventions for children at-risk for EBD are likely to be implemented by general rather than special education staff because children may have plans that are not devised or supervised by special education personnel. Recent surveys of general education early childhood staff identify a considerable lack of knowledge exists about interventions designed to support children exhibiting problem behavior; the chasm between teacher knowledge and evidence-based practice is particularly apparent for general education teachers (Stormont, Reinke, & Herman, 2011a). Although teachers agreed that prevention of problem behavior is important, teachers reported they are ill equipped to select appropriate individualized interventions to address problem

behavior and engagement (Hemmeter, Corso, & Cheatam, 2006; Snell et al., 2012). Another recent survey of general education early childhood professionals found approximately 90% of respondents could identify that support was available for children exhibiting problem behavior, but only 40% believed assessment of problem behavior occurred in their school (Stormont, Reinke, & Herman, 2011b). Given a list of evidence-based interventions for children with EBD, teachers reported they had never heard of 90% of the interventions (Stormont et al., 2011b). Although teachers reported services were available (Snell et al., 2012; Stormont et al., 2011a; Stormont et al., 2011b), teachers indicated they lacked the knowledge required to select and implement evidence-based practices for children with or at-risk for EBD. Consequently, teachers selected intervention strategies for children with or at-risk for EBD based on convenience or familiarity rather than the function of each child's problem behavior (Gable, Park, & Scott, 2014).

Interventions designed to be implemented in general education need to prevent the occurrence of problem behavior, increase children's engagement, and require minimal specialized training or knowledge on behalf of the teacher. Antecedent interventions designed to manipulate the physical environment before problem behavior occurs may be feasible and practical for implementation in non-specialized settings (Kern, Choutka, & Sokol, 2002). Antecedent interventions include visual cues and materials manipulations implemented before an activity that decrease the likelihood of problem behavior and increase the likelihood of engagement (Blair, Umbreit, Dunlap, & Jung, 2007; Conroy, Dunlap, Clarke, & Alter, 2005). Most antecedent interventions incorporate student choice in the intervention materials or task order (Kern et al., 2002). Antecedent interventions have most frequently been used to improve on-task, disruptive, and aggressive behaviors for children with disabilities, although few studies

have investigated their effectiveness with children at-risk for disability (Kern et al., 2002). Two antecedent interventions that are commonly recommended for use to improve engagement and problem behavior *and* that are feasible interventions in general education classrooms are social stories and visual cues (Blair et al., 2007; Breitfelder, 2008; Center on the Social Emotional Foundations for Early Learning; Lane et al., 2007).

Social Stories

Social stories are narratives written to make expected behaviors and setting characteristics more salient for specific routines, activities, or events children experience in which they do not engage in appropriate prosocial behaviors (Gray & Garland, 1993; Gray, 1994). Social stories explain the who, what, where, when, and why in short sentences to increase the likelihood a child will engage in the appropriate behaviors for a target activity. Stories are read immediately before the activity in which a child is expected to display the targeted behaviors. Social stories have frequently been implemented with children with autism spectrum disorders (ASD). Reviews of the effectiveness of social stories for children with ASD have mixed results; some reviews suggest social stories are an evidence-based practice (Mayton et al., 2013; Wong et al., 2014), whereas another concludes they are not evidence-based due to inconsistent outcomes and poor design quality (Leaf et al., 2015). A review of social stories interventions for children without ASD found evaluations were conducted in the context of low quality single case research designs; authors concluded social stories were not an evidence-based practice for children who do not have ASD (Zimmerman & Ledford, 2017).

Despite evidence that social stories are more likely to be ineffective than effective at improving outcomes for children, teachers frequently use social stories, report they are easy to implement, and identify them as an acceptable intervention to improve child outcomes (Fees et

al., 2014; Wikete Lee, 2016). The conditions under which social stories may be effective for children at-risk for EBD are unknown. Additionally, the impact of story format (deMers, Tincani,Van Norman, & Higgins, 2009) or the addition of comprehension questions (Benish & Bramlett, 2011; Schneider & Goldstein, 2009) on outcomes has not been determined. No studies to date have evaluated the effectiveness of social stories in improving engagement and decreasing problem behavior for children at-risk for EBD in general education settings.

Visual Supports

Visual supports are drawings, images, or materials (e.g., picture icons, timers) added to the physical environment to provide information about the expected sequence of activities or steps within an activity (Wong et al., 2014). Two common types of visual supports are visual activity schedules (VAS; Krantz, MacDuff, & McClannahan, 1993) and structured visuals such as work boxes (Hume & Odom, 2007).

VAS interventions are an evidence-based practice for improving task engagement, transitions, play, and adaptive behaviors in community, school, and home settings for individuals with ASD (Knight, Sartini, & Spriggs, 2014; Koyama & Wang, 2011; Lequia, Machalicek, & Rispoli, 2012; Wong et al., 2014). VAS interventions can assist children with transitions between activities across the school day or within steps of a single activity (Breitfelder, 2008). Few evaluations of VAS interventions for children in early childhood settings have included children without developmental disabilities (Cirelli, Sidener, Reeve, & Reeve, 2016; Watson & DiCarlo, 2016; Zimmerman, Ledford, & Barton, 2017); the majority of evaluations have been conducted with children with ASD or developmental disabilities. VAS presentation formats have also varied across studies with children in preschool and elementary schools between book formats (pages connected in a binder; Bryan & Gast, 2000), linear left to right traditional formats

(Dettmer, Simpson, Myles, & Ganz, 2000), and digital formats (iPad; Brodhead, Courtney, & Thaxton, 2017). Prompting procedures have not varied across studies; graduated guidance procedures have been used most frequently to teach VAS use to children (Lequia, Machalicek, & Rispoli, 2012). One study evaluated the use of constant time delay (CTD) procedures to teach schedule use to children at-risk for social delays in an inclusive preschool classroom (Zimmerman, Ledford, & Barton, 2017). No studies to date have assessed child preference for VAS format.

Structured visuals (SV) are visual supports added to the environment to provide a format for organizing tasks or provide additional opportunities to respond. These visual supports provide structure and predictability for tasks using frequently changing materials or tasks in which individual opportunities to respond may be unclear. SV may be presented as organizational tools such as structured work boxes (SWB) or as visual cues such as hundred charts or alphabet charts. SWB are plastic bins, fabric boxes, or other containers used to organize materials for a task and provide visual structure (Hume & Odom, 2007). Often provided in conjunction with VAS as part of a structured teaching multi-component intervention (Mesibov & Shea, 2010), SWB have been used to increase task engagement, independence, and task completion (Hume & Odom, 2007). SWB have been used in inclusive early childhood settings during free play centers with VAS (Bennett, Reichow, & Wolery, 2011; Hume & Odom, 2007) and with structured visual cues such as a hundreds chart during whole group math instruction (Zimmerman, Ledford, & Severini, 2018) to improve engagement for children with ASD and developmental disabilities. Across all studies, engagement behaviors increased using the SV when graduated guidance procedures were used. However, the precise level of prompting required to complete visual supports interventions is unknown given the parameters of graduated

guidance procedures.

The purpose of this investigation is to evaluate two commonly recommended, low-effort interventions designed to improve engagement and decrease problem behavior: social stories and visual supports. The current study will specifically attempt to (a) provide an evaluation of the effectiveness of social stories for increasing engagement and decreasing problem behavior for children at-risk for EBD in general education classroom in the context of a rigorous, single case research design, (b) extend the use of visual supports interventions (VAS and SV) to children at-risk for EBD in general education classrooms, (c) evaluate the effectiveness of CTD procedures for increasing independent VAS and SV use by children, and (d) evaluate the acceptability and feasibility of social story and visual support interventions for improving outcomes for children exhibiting problem behavior. The research questions to be addressed in the study are: (1) Are social stories effective for increasing engagement and decreasing problem behavior for children at-risk for EBD in general education classrooms? (2) Are visual support interventions (VAS and SV) effective for increasing engagement and decreasing problem behavior for children at-risk for EBD in general education classrooms? (3) Are social stories an acceptable and feasible intervention for improving outcomes for children with problem behavior? and (4) Are visual supports (VAS or SV) an acceptable and feasible intervention for improving outcomes for children with problem behavior?

CHAPTER II

METHODS

Participants

Target child participants. Participants included 7 children between the ages of 5-7 years who were at-risk for EBD due to elevated levels of problem behavior and low levels of engagement as reported by their teachers using the Social Skills Improvement System (SSIS; Gresham & Elliot, 2008). Participants were nominated for participation by their teachers based on their inability to complete daily classroom activities and routines due to a performance deficit rather than a skill deficit. Two 30 min observations (Appendix A), a structured teacher interview (Appendix B), and teacher reports of engagement and problem behavior (SSIS; Gresham & Elliott, 2008) were used to determine if children met study inclusion criteria. Children met the following criteria to be considered for study participation: (1) display below average engagement compared to age and gender norms, (2) exhibit problem behavior at above average levels compared to age and gender norms, (3) demonstrate consistent school attendance (no more than two absences per month on average), (4) demonstrate object-picture correspondence, and (5) receive instruction in a general education classroom during the targeted activity. Children were excluded from study participation if they met one or more of the following criteria: (1) diagnosis of an autism spectrum disorder, developmental disability, or intellectual disability, (2) average or above average levels of engagement as determined by the SSIS (Gresham & Elliot, 2008), (3) average or below average levels of problem behavior as determined by the SSIS (Gresham & Elliot, 2008), (4) use of a VAS or SV in current support plan, and (5) aversion to physical

prompting by an adult. One child was excluded from study participation due to an above average level of engagement on the SSIS and one child was excluded due to teacher report of substantial improvements in engagement when the class size was reduced from 26 to 18 students before initiation of the inclusion screening process.

Five children participated in the study across three general education classrooms. Two first graders (Xander and Raven) and two preschoolers (Marc and Michael) did not receive special education services; one kindergartener (Jason) received special education services as a student with a developmental delay. All children passed the cognitive screening measure of the Battelle Developmental Inventory, Second Edition Normative Update (BDI-NU, Newborg, 2016), thus the presence of cognitive delays were unlikely. Teachers reported Xander, Raven, and Jason were below grade level in all academic subjects; Marc and Michael were on or above grade level in all pre-academic subjects.

Xander, Raven, and Michael displayed low levels of engagement during whole group activities, Jason displayed low levels of engagement during independent reading centers, and Marc did not engage with the classroom morning routine. All children eloped from designated locations during targeted activities; Jason and Michael also engaged in inappropriate peer interactions. The Functional Analysis Screening Tool (FAST; Iwata & DeLeon, 1996) was completed by the researcher in collaboration with the classroom teacher to identify the function of each child's problem behavior. Results of the FAST indicated all children exhibited socially maintained problem behavior. Additional participant information can be found in Table 1.

Xander was a 7-year-old African American male in first grade who was at-risk for disability due to elevated levels of problem behavior. Immediately following lunch, he either refused to enter the classroom for reading instruction or would leave the classroom during whole

group reading instruction. Xander did not receive special education services and was completing a referral process to receive individualized counseling at the school in which he attended.

Jason was a 6-year-old African American male in kindergarten who received special education services as a child with a developmental delay. Jason was paired with a peer partner to complete two reading centers daily; five of the centers included materials to be shared between the pair: letter stamping, alphabet center, building consonant-vowel-consonant word puzzles, independent reading, and writing. At letter stamps Jason would stamp letters on his peer's paper, body, clothing, and chair rather than his designated worksheet. At the alphabet center, Jason pulled his peer's letters off of the magnetic surface. When building consonant-vowel-consonant words, Jason took pieces from the shared materials bin and hid them from his peer. During independent reading Jason hit the peer's book with his hand or another book, and during writing Jason would hit the peer's arm with his elbow as she placed her pencil to paper. Jason received related speech and occupational therapy services; he did not receive counseling services. Jason did not receive special education services during independent reading centers in his general education classroom.

Raven was a 6-year-old African American female in first grade who was at-risk for disability due to elevated levels of problem behavior. Immediately following the classroom 'brain break' in which the class watched a brief physical activity video and song on the SMARTboard, Raven would elope to the back of the classroom rather than joining her peers on the classroom carpet for whole group math instruction. Raven did not receive special education services, but she did receive individualized counseling once a week, and participated in a daily check-in check-out system as a Tier II intervention during the course of the study.

Marc was a 5-year-old White male who was at-risk for disability due to elevated levels of

problem behavior. When Marc arrived at school, he would hide behind the classroom door or lay in the hallway; he was not observed to independently enter the classroom and begin his morning routine. The teacher reported Marc's family had a story about school they read at night; no classroom interventions were in place at the time of the study to support Marc's appropriate engagement in instructional activities or routines. Marc did not receive special education services, although he was referred for evaluation during the last two weeks of the study.

Michael was a 5-year-old Hispanic male who was at-risk for disability due to elevated levels of problem behavior. During morning meeting, Michael rolled on the floor, left the meeting area, and hid his face in his jacket or sweatshirt. Michael's teacher also reported he would push, hit, or knock into peers during dancing and partner activities. Michael did not receive special education services or any individualized classroom interventions.

Peer comparisons. Classroom teachers were asked to rank all children in their classroom based on classroom participation, engagement, and compliance (see Appendix C). The researcher selected one child in the middle of the classroom to be observed as a peer comparison to evaluate the social validity of behavior change. Typical peers met the following criteria for inclusion as peer comparisons: (1) typical development or a disability that does not impact classroom engagement or increase the likelihood of problem behavior, (2) average no more than two absences per month, (3) yield average engagement scores on the SSIS (Gresham & Elliot, 2008), and (4) be present in the target child's classroom during target activities or routines. Parental consent was only obtained for a peer comparison participant in Xander and Raven's classroom; peer comparison data were not collected for Jason, Marc, or Michael. Once parental consent was obtained, the classroom teacher completed the SSIS (Gresham & Elliot, 2008) for the peer comparison. Although the peer's scores on the SSIS are not considered average, they were

indicative of an "average" child in Xander and Raven's classroom given the high-needs population the school served (data are displayed in Table 1).

Implementers. The first author, a doctoral candidate in early childhood special education and applied behavior analysis, and the third author, a first-year graduate student in early childhood special education and applied behavior analysis, implemented sessions. The first author had 10 years of experience working with children exhibiting problem behavior and had implemented both social story and visual support interventions in general education classrooms. The third author had less than a year of experience working with children exhibiting problem behavior and had not previously implemented either social story or visual support interventions in general education classrooms. The first author was the primary pre-session implementer for Xander, Raven, and Jason and the session implementer for Marc and Michael. The third author was trained by the first author and conducted pre-sessions for Marc and Michael and sessions for Xander, Raven, and Jason. If either implementer was not available, a third graduate student in special education implemented sessions during both the social stories and visual support comparisons.

Setting

Sessions were conducted in general education classrooms at two Title I schools (one early learning center and one elementary school) in a large, urban public school district in the Southeastern United States. Intervention sessions occurred during whole group instruction (reading, Xander; math, Raven), independent reading centers (Jason), the morning arrival routine (Marc), or morning meeting (Michael). One general education teacher and a researcher were present in the first grade classroom (Xander and Raven); a general education teacher, paraprofessional, and researcher were present in the preschool (Marc and Michael) and

kindergarten (Jason) classrooms. A student teacher was also present in the kindergarten classroom. Twelve to 20 children were present in each classroom during sessions.

All children not participating in research activities were in the targeted instructional area during Xander, Raven, and Michael's sessions. Jason completed reading centers with one peer partner and two-four children were present in the morning arrival area during Marc's sessions. Children and adults not participating in research completed activities per the typical classroom routine. Participants remained in close proximity to non-participating adults and children during sessions; participants were removed from the classroom during pre-sessions. Pre-sessions were approximately 2 min in duration; sessions were 5 min (Xander, Raven, Marc) or 10 min (Jason, Michael) in duration. Pre-sessions and preference assessments occurred in the hallway seated on the floor adjacent to the classroom door. One child and one researcher were present during pre-sessions and preference assessments, although non-participating children and adults frequently walked through the hallway.

Kindergarten and first grade. Classroom centers including computers, writing cubbies, books, and a calm down area were present in both classrooms. A kidney table and a large group carpet area were also present in the classrooms. The kindergarten classroom had a large group carpet below a SMARTboard in the front of the classroom with four rectangular child tables and child-sized chairs on the perimeter of the carpet. The first grade classroom had the same organization with octagonal child tables and child-sized chairs. An easel was adjacent to the SMARTboard and a wooden 0.6 m tall stage was at the front of each carpet to assist children in reaching the SMARTboard in both classrooms.

Preschool. The physical layout of the room included centers created via the arrangement of bookshelves, wooden cubbies, and tables. Child cubbies lined the entry of the classroom as a

designated morning routine center. Art, blocks, dramatic play, books, table toys, computers, and large group carpet area centers were present in the preschool classroom. Materials in centers were organized in bins with picture and word labels on the outside of the bins and the shelf in which they were stored. The large group carpet area was adjacent to the back of the cubbies under a pull-down projector screen. An easel was placed at the back of the carpet to display the daily question and attendance sign in for children.

Social stories were only present during pre-sessions; visual supports were present during pre-sessions *and* located in the area in which children were expected to complete targeted instructional activities. Exact positioning of the visual support was determined in conjunction with classroom teachers to increase the likelihood teachers would continue the intervention after study completion.

Materials

Preference assessments, baseline, and intervention sessions were videotaped for data collection purposes using a Cannon Vixia Mini camera. Sessions were recorded in two video segments (pre-session and session) to allow for coding by observers blind to study condition; visual supports sessions occurred in the same manner, although observers were not blind to study condition because the visual supports were visibly present or absent in the environment. Primary response and reliability data were collected via video using ProCoderDV (Tapp, 2003). Preference assessment, correct completion, and procedural fidelity data were collected via paper and pencil recording forms (see Appendix D; Figures 1, 2, and 3). The timer on the Cannon Vixia Mini camera was used to monitor session length.

Teacher interview and assessment. A structured interview was completed with each classroom teacher to identify (a) the activities or routines in which the target child displayed low

engagement, (b) expected behaviors or tasks to be completed during the instructional activities or routines, and (c) demographic information about the child (e.g., age, gender, race, disability status, family SES, attendance history). The FAST (Iwata & DeLeon, 1996) and SSIS (Gresham & Elliot, 2008) were completed by the classroom teacher in collaboration with the researcher; one copy of each assessment was used during the teacher interview. The teacher interview was not videotaped and data were recorded in situ by the researcher (see Appendix B).

Preference assessments. The same social story (Figures 4, 5, and 6) and VAS (Figures 7, 8, and 9) were presented in three different formats during the preference assessment (book, traditional, and digital) for Xander, Raven, and Jason; the digital format was not presented for Marc and Michael because the classroom did not have an iPad. Jason did not complete a VAS preference assessment because the teacher and researcher selected SWB as his visual support and no corresponding electronic format was available.

Book format. The book format was 4-6 total pages with a single step per page (see Figures 4 and 7). Pages of each book were 13.97 cm x 21.59 cm and attached with three metal rings (0.86 cm in diameter). The pages of the book were identical to each page of the electronic social story presented on the iPad for Xander, Raven, and Jason. A 10.16 cm photograph with one sentence typed in 18 pt Times New Roman font (social story; Figure 4) were presented on each page for Marc and Michael. A 7.62 cm x 5.08 cm icon created using Boardmaker© software was presented on each page of the visual support book. The background of each page was solid white; all pages were laminated.

Traditional format. The traditional formats varied by intervention based on previous research (Gray & Garland, 1993; Krantz, MacDuff, & McClannahan, 1993). The social story was presented on a letter-sized single page with Times New Roman font (size 14) with no more than

4 photographs from the targeted classroom activity taken from screen shots of baseline sessions (see Figure 5). The VAS was presented on a rectangular 30.5 cm x 7.62 cm piece of cardstock (see Figure 8). Icons were 7.62 cm square white squares with images and text depicting each step created using Boardmaker© software. Each of the icons were sequentially placed horizontally left to right (Xander, Raven, Michael) or vertically top to bottom (Marc) on the cardstock in the order in which each step was to be completed. A quart-sized plastic bag was placed at the end (Michael) and bottom (Marc) of the schedule to collect completed icons.

Digital format. An iPad 2© was used to present the digital formats using the Social Stories Creator and Library App© (social stories; Figure 6) for Xander, Raven, and Jason; visual schedules were presented using the Choiceworks Social Behavior and Scheduling App© (VAS; Figure 9) for Xander and Raven.

Social stories. The content for each story was selected by the researcher in collaboration with the classroom teacher to reflect the behaviors required to complete the targeted activity. Each story was created using the guidelines from Gray (1994): 2-5 sentences describing the context (when, where, and why the behavior occurs), perspectives of others, assistance provided by others, and affirmative statement defining the shared value of engaging in the desired behavior; and up to 2 sentences stating the expected behavior during the scenario. Three comprehension questions were printed on an additional page accessed only by the researcher to assess the child's comprehension of the content (Schneider & Goldstein, 2009). One social story format was used for each participant, per the results of the child's preference assessment.

Visual supports. The visual supports included a VAS or SV (SWB or structured visual cues). Interventions were selected by the researcher in conjunction with the classroom teacher based on classroom observations and the nature of the target activity/routine (see Appendix E

and F). The VAS intervention was selected for all participants except Jason. A VAS was selected for intervention during whole group activities to promote children's engagement, indicate when children had opportunities to respond, and when the activities would be complete (Xander, Raven, Michael). A VAS was selected for intervention for the morning routine with Marc following previous research investigating improving engagement in routines for children at-risk for disability (Zimmerman, Ledford, & Barton, 2017).

SWB were selected for intervention during independent reading centers for Jason because the center tasks required specific materials following previous research investigating improving engagement in activities with variable materials for young children with developmental disabilities (Bennett, Reichow, & Wolery, 2011). VAS were presented in the child's preferred format as determined by the preference assessment; SV formats were determined by the researcher and teacher. Decision rules for selecting VAS and SV interventions can be found in Appendix E and F.

SWB for Jason were cardboard opaque bins (27.9 cm tall x 31 cm wide x 10 cm deep) in which each instructional material was stored (see Figure 10). Instructional materials contained in Jason's boxes were the materials specific to each activity in the classroom (e.g., stamp pad, letter stamps, worksheets magnetic letters, word puzzles, library books).

Planned modifications. Planned modifications were implemented to the visual support interventions for Marc and Michael after visual analysis indicated insufficient improvements in engagement occurred after use of a VAS during the morning routine (Marc) and morning meeting activities (Michael). Images of preferred television show characters (*Ben 10©* aliens) were added to each location in which Marc completed his morning routine as a curricular revision to decrease the duration of time Marc spent unengaged with the initial steps of the

morning routine. One image of an alien character from the television show *Ben 10©* was placed at each of the locations in which Marc affixed his schedule: cubby, daily question easel, shelf adjacent to the classroom sink, and on the correct page of his morning sign in book (four images in total). Images were obtained via an internet search for aliens associated with the show and were printed 2.5 cm tall with a single piece of Velcro attached to the back of the image to affix it to the hard surfaces.

A secondary visual support was implemented with Michael after engagement behaviors did not substantially improve when the initial VAS intervention was implemented. An SV in the form of structured visual cues were implemented and novel materials were introduced to increase the child's number of opportunities to respond (e.g., counting chart during classwide counting; Zimmerman, Ledford, & Severini, 2018). SV for Michael was a book with five to seven 13.97 cm x 21.59 cm pages, one page for each task during the targeted activity, that were connected by three 2.5 cm in diameter metal rings (see Figure 10). The instructional materials present in Michael's SV were created by the researcher to provide him with structured opportunities to respond that aligned with typical activities (e.g., a page with numbers 1-20 for pointing while all children counted aloud; see Figure 10). The process for selecting researcher-created materials can be found in Appendix F.

Response Definitions and Measurement Systems

The primary dependent variable across all studies was engagement; the presence of a functional relation was assessed by visually analyzing graphed engagement data. Problem behavior was a secondary variable of interest. The same engagement and problem behavior response definitions were used across participants in both comparisons; problem behavior examples and nonexamples were individually defined for each participant based on observations

and results from the FAST (Iwata & DeLeon, 1996). Examples and nonexamples of problem behavior were used across both comparisons for an individual child. Correct completion behaviors were only assessed during the visual supports intervention.

Choice during preference assessment. Participant choice during the preference assessment was defined as the participant grasping an item with one or both hands for at least 5 s, bringing an item within 61 cm of the participant's body, or pointing to an item with a single finger or full hand. Any of these actions could occur with or without eye gaze. Primary data were collected in situ; reliability data were collected via video. Choice responses during the preference assessment were measured on a trial by trial basis using a paper and pencil data recording sheet (Appendix D). The item selected by the participant was recorded for each trial; if no selection was made the response "NR" was recorded.

Engagement. Duration of engagement was estimated using a 5 s momentary time sampling (MTS) procedure across all conditions (Ayres & Ledford, 2014). All data were collected via video using ProCoderDV (Tapp, 2003; see Figure 11 for sample data collection file). Engagement definitions were adapted replications from previous evaluations of VAS and SWB studies (Zimmerman, Ledford, & Barton, 2017; Zimmerman, Ledford, & Severini, 2018). Operational definitions, examples, and nonexamples of engaged and unengaged behaviors can be found in Table 3. The total percentage of intervals in which each participant was engaged was calculated for each session using the following formula: (total number of intervals in which the child was engagement/total number of intervals]x100).

Problem behavior. Problem behavior was measured via duration (out of location behaviors) and timed-event recording (inappropriate peer interactions) using ProCoderDV (Tapp, 2003) across all conditions (see Figure 11 for sample data collection file). Out of location

behaviors were measured for all children; inappropriate peer interactions were measured for Jason and Michael. Operational definitions, examples, and nonexamples of problem behavior definitions can be found in Table 4.

Out of location. Out of location was defined as the child's body existing outside the plane of the designated instructional area. The designated instructional area was the perimeter of the classroom large carpet (Xander, Raven, Michael) and the reading center table or the perimeter of the carpet in the books center (Jason). The designated instructional area moved to each morning routine task location for Marc: the perimeter of the child cubbies to put away his belongings, 30.5 cm radius around the front of the classroom easel with the daily question, the perimeter of the rug below the classroom sink and towel dispenser for washing hands, and the perimeter of the sign in table for the daily sign in. The walking paths between each location were clearly marked by the classroom furniture; thus, Marc was in location if he was walking between designated locations in the morning routine. The onset of out of location began when every part of the child's body left the plane of the perimeter of the designated area (defined above); offset began when any part of the child's body crossed the plane of the perimeter of the designated area. The total duration of time each child was out of location for each session was totaled by calculating the total number of seconds the child spent out of the designated instructional area.

Inappropriate peer interactions. Inappropriate peer interactions were defined as any instance in which the child (a) threw a material at a peer or (b) intentionally physically contacted the peer or peer's materials in an inappropriate manner with his body or a material in his possession. Incidental contact such as children's shoulders touching when sitting on the carpet was not included. Each instance was counted at the moment at which the target child (a) released a material from his grasp when throwing, (b) physically contacted the peer with his body, or (c)

physically contacted the peer with a material in his possession. The total number of instances of inappropriate peer interactions for each session were calculated by adding the number of behaviors that occurred during each session.

Correct completion. Correct completion of visual support task analysis procedures was measured during the visual supports condition. Task analysis steps for VAS were adapted based on previous research that suggests removal of icons may not be an essential step when using VAS interventions for children without disabilities (Watson & DiCarlo, 2016; Zimmerman, Ledford, & Barton, 2017). Previous research evaluating the use of SV with children without developmental disabilities has not been conducted; use of CTD should be considered exploratory. Four possible responses were collected for each step of the VAS task analysis: unprompted correct (UPC), prompted correct (PC), unprompted error (UPE), and prompted error (PE). Participant correct completion of a single step of the task analysis prior to delivery of an adult prompt was coded as UPC; after delivery of the prompt was coded as PC. Participant incorrect completion of a single step of the task analysis prior to delivery of an adult prompt was coded as UPE; after delivery of the prompt was coded as PE. The controlling prompt was gestural prompting (pointing) for all children. Task analysis steps are displayed in Table 5. The percentage of steps completed correctly and incorrectly, with and without prompting, was totaled for each session for each participant.

Experimental Design

Two sequential alternating treatments single case research designs (ATD; Barlow & Hayes, 1979) were used to evaluate two comparisons: (a) social stories comparison and (b) visual supports comparison. The use of an ATD allowed for rapid alternation between conditions rather than extended time in conditions in which no behavior change was hypothesized to occur

(baseline and all three social story conditions). Conditions were randomized in blocks of four in the social stories comparison condition using a blocked random sequence (e.g., each condition randomly occurs once in a sequence) and random number generator. Conditions were randomly ordered using a random number generator in the visual supports comparison; sessions were limited to only occur twice in a row in the visual supports comparison. The presence of a functional relation was evaluated using visual analysis by assessing differentiation in level and overlapping data between conditions (Gast & Spriggs, 2014). Initial baseline (before the social stories comparison) and best alone conditions (after the social stories and visual supports conditions) were conducted to detect possible multitreatment interference.

During the social stories comparison, each intervention condition (social story, social story plus comprehension questions, and book alone) was evaluated relative to each other and a baseline no-intervention condition. Visual supports comparisons occurred after the social stories comparison. If differentiation between intervention conditions occurred during the visual supports comparison, as determined by visual analysis, then a final best alone condition was conducted.

Procedures

Sessions occurred daily for all participants except Raven; sessions occurred four days a week due to Raven's counseling schedule. Pre-sessions and sessions were 2 min and 5 or 10 min in duration, respectively. Five min sessions were selected for Xander and Raven because the teacher reported mini-lessons lasted approximately 5-7 min prior to study initiation. Five min sessions were selected for Marc after the researcher observed children in the classroom complete the morning routine in approximately 5 min; the classroom teacher confirmed it should take children about 5 min to complete the routine. Ten min sessions were selected for Jason and

Michael because classroom centers (Jason) and morning meeting (Michael) were observed to be approximately 10 min in duration; both classroom teachers confirmed they expected each activity to last approximately 10 min.

Child verbal assent was obtained prior to implementation of any study procedures. The researcher asked the child, "do you want to work together today?" If the child said yes, shook his/her head yes, or grabbed the researcher's hand, he/she assented to study procedures. If the child said no, shook his/her head no, or pushed the implementer's hand, he/she did not indicate willingness to participate. The researcher said, "okay" and walked away for 5 min then redelivered the assent question. If the participant indicated he/she was not willing to participate after the second assent question, a session was not conducted. Xander declined to participate in study procedures for one instance during the study; all other participants assented to study participation each time they were asked.

Preference assessments. A multiple stimulus without replacement (MSWO; DeLeon & Iwata, 1996) preference assessment was conducted before initiation of the study to assess child participant preference for intervention format. In consultation with the classroom teacher, the researcher created one social story in three formats: (a) book format with one sentence per page, bound with metal spiral rings (Figure 4), (b) traditional single-page format (Figure 5), and (c) an iPad interactive social story using the Social Stories Creator and Library App© (Figure 6). A VAS was also created in three formats for one target activity: (a) book format with one image per page, bound with metal spiral rings (Figure 7), (b) traditional linear format with icons presented horizontally on cardstock (Figure 8), and (c) iPad schedule using the Choiceworks Social Behavior and Scheduling App© (Figure 9). A paired stimulus preference assessment (Fisher et al., 1992) was conducted if the classroom teacher reported students did not have access

to an iPad (Marc and Michael). The content of the social story and VAS were constant; only the presentation format changed. A social stories preference assessment was conducted for each participant; all participants except Jason completed a second preference assessment to assess child preference for VAS format.

For each participant, the entire array of possible items was presented 5 (Marc and Michael because digital formats were not available) or 6 times (Xander, Raven, and Jason because digital formats were available). Prior to beginning the preference assessment, the researcher told the child, "I want to see which one you like best. It will help me know your favorite so we can use it in your classroom." To begin a trial, the researcher placed each format of the intervention in a randomly selected location and delivered the task direction, "pick one" to the child. The child was given 10 s to select a presentation format. When a format was selected by the child, the researcher removed the remaining items for 5 s. Then the implementer collected the selected item from the child, and presented the remaining formats while delivering the task direction again, "pick one." If a child did not select a format, the researcher removed all items and waited 5 s before delivering the next task direction, "pick one." This process was repeated a third time for Xander, Raven, and Jason because the digital format was included in the assessment; the trial was over after three presentations. The researcher recorded child selections on the data sheet in Appendix D.

General. Two research activities occurred daily across all conditions and comparisons: a pre-session and a session. The pre-session researcher walked inside the classroom and delivered the assent script for all children except Marc; the pre-session researcher met Marc in the hallway upon school arrival and delivered the assent script. After child assent was obtained, the pre-session researcher took the child to the designated location in the hallway adjacent to the

classroom door, turned on the camera and placed it adjacent to the child and researcher, and told the child the condition for the day (e.g., today is a *story and questions* day). The pre-session researcher told the child they would stay in the hallway until the timer said 02:00. After pre-session procedures were implemented for the designated condition, the pre-session researcher said, "It's time for (*targeted activity*)" and walked the child to the classroom door.

The pre-session researcher stayed in the hallway during Xander, Raven, and Jason's sessions; the session camera was mounted on a classroom bookshelf or cabinet during the sessions. The pre-session researcher entered the classroom during Marc and Michael's visual support sessions to move the camera when needed to capture each child during his targeted activity; the pre-session researcher did not interact with either child and ignored bids for attention. At the end of each session, the camera was stopped by the session researcher (Xander, Jason, Raven) or pre-session researcher (Marc, Michael). If the child did not complete the visual support task analysis prior to session termination, or if the instructional activity lasted longer than the session, the researcher waited until the end of the instructional activity then stopped the camera and gathered the visual support. Specific procedures across conditions are detailed below.

Baseline. Pre-session and session procedures were the same across both comparisons for the baseline condition. During baseline pre-sessions, the pre-session researcher told the child it was a "talk day" and that the child could talk about anything he or she wanted. The pre-session researcher responded to child statements, but did not ask the child any questions or make any statements related to expected behaviors during the upcoming activity or routine. If the child did not talk, the pre-session researcher would make general statements (e.g., I like your shoes; I'm going on a trip this weekend) approximately once every 30 s.

During baseline sessions, no additional verbal, gestural, or physical prompts were delivered to the child. The session researcher told the teacher to conduct the activity as she typically would if the research study were not occurring with the exception of Marc. The researcher asked the teacher not to follow Marc into the hallway if he failed to enter the classroom; the pre-session researcher stayed in the hallway to monitor Marc's safety. The session researcher was present while videoing all baseline sessions with the exception of Raven; the session researcher did not stay in the classroom to monitor the camera angle for Raven after the first author observed Raven left her instructional area to walk to the novel adult during the classroom observations conducted prior to study initiation.

Social stories intervention. The social stories comparison included one no-intervention condition (book alone, [BA]) and two social stories intervention conditions (social story [SS] and social story plus reading comprehension questions [SSRC]). The format of the social story across conditions was the same and determined by the results of the preference assessment evaluating participant preference for intervention format (see Tables 1-3). Social stories intervention conditions consisted of two parts, a pre-session and session. The pre-session behaviors varied by comparison condition. During the social stories comparison, the session procedures were identical to baseline (i.e., for this comparison, session procedures were identical throughout—only pre-session procedures differed). During social stories pre-sessions, the pre-session researcher told the child, "we're going to read a story about (book content, e.g., spiders; BA) or (what to do during target activity/center; SS, SSRC)." Next the pre-session researcher read the book corresponding with the appropriate condition.

A different leveled reader (guided reading level A-B) was read during each BA session; the texts were selected using a random number generator from a set of 10 possible books. Texts

at this level typically have 1 sentence per page with a single image and are no longer than 15 pages, roughly estimating the time it would take to read a social story. The pre-session researcher did not ask questions during or after reading the text.

The target activity social story was read during the SS and SSRC conditions. Three comprehension questions were asked after reading the social story during the SSRC condition only. The three questions were modeled after previous research implementing social stories with children without developmental disabilities (Schneider & Goldstein, 2009). Questions were specific to the target activity/routine of the story and asked the child to name the expected behavior, how to complete the behavior, and what happens if he/she exhibits the behavior. CTD procedures were implemented to assist children in responding to questions in the SSRC condition; 0 s delays were used in the first two SSRC sessions and a 3 s terminal delay was used for remaining sessions. The controlling prompt was a verbal model of the correct answer to the question. If the child answered the question correctly the pre-session researcher said, "yes, that's right" and repeated the child's answer (e.g., you will sit down on carpet). If the child incorrectly answered the question, the pre-session researcher said, "no" and provided the correct response. If the child failed to deliver a response, the pre-session researcher delivered the controlling prompt at the appropriate delay, waited 3 s for a child response, then moved to the next question. If the child asked questions during the book relevant to the book content, the pre-session researcher provided an answer to the question. Questions irrelevant to the content received the following response, "we're reading a book now-we can talk at the end" and the pre-session researcher answered the question after reading the book. At the end of book reading (BA, SS) or comprehension questions (SSRC), the pre-session researcher checked the time on the camera. If less than 2 min had elapsed, the researcher told the child they could look at the book or story

until the timer said 02:00. When the timer on the camera reached 02:00, the pre-session researcher stopped the camera, said "it's time for (target activity)", left the social story or book in the hallway, and walked the child to the classroom door. The classroom teacher was not informed of the implemented social story condition.

Sessions were identical to baseline sessions during intervention; the intervention context and measurement context were separate during all conditions of the social story comparisons. The videographer did not engage with the child; if the child asked the videographer a question, the videographer said, "I'm doing work for (teacher name)."

Visual supports intervention. The visual supports comparison included one visual support intervention condition (VAS, SV) compared to a baseline condition. The format of the visual support was determined by the results of the preference assessment evaluating participant preference for intervention format (see Table 2) or researcher selection of an SV intervention (Jason and Michael). Visual support intervention conditions consisted of two parts, a pre-session and session.

During visual support pre-sessions, the pre-session researcher told the child, "today is an iPad schedule (Xander, Raven), work box (Jason), book (Michael), or schedule (Marc, Michael) day". Next the pre-session researcher said, "This is your (name of visual support). I'm going to show you how to use it." Then the pre-session researcher modeled how to manipulate the visual support (e.g., swipe the icon to the right when a task is complete; iPad schedule) with verbal directions when required (e.g., choice means you can pick to ask to get water or stay and earn a ticket). The pre-session researcher did not ask the child any questions about using the visual support, but answered any questions posed by the child. At the end of the model, the pre-session researcher checked the time on the camera. If less than 2 min had elapsed, the researcher told the

child they could look at the visual support until the timer said 02:00. When the timer on the camera reached 02:00, the pre-session researcher the pre-session researcher stopped the camera, gave the child the visual support, told the child "it's time for (target activity)," and walked the child to the classroom door.

Constant time delay (CTD; Wolery et al., 1992) procedures were used by the session researcher to prompt VAS and SWB task analyses (see Table 5). During the first two intervention sessions, 0 s delays were used for all steps of the task analyses. Subsequent sessions used 5 s intervals for locating the correct icon (VAS) and removing materials from and returning materials to buckets (SWB); 10 s wait intervals were used for task initiation across both task analyses for all participants except Xander and Raven. Marc was also prompted to take his VAS to each morning routine location using a 5 s wait interval. Gestural prompting (pointing) was used as a controlling prompt when implementing CTD procedures; verbal prompting was not provided across any conditions. Continued engagement with target activities or tasks was not prompted by the session researcher. If a participant failed to appropriately manipulate target materials for 30 s or moved away from target materials for more than 30 s, the session researcher prompted the participant to engage in the next step of the task analysis to remove the current icon or locate the next icon (VAS) or return materials to the bin (SWB). The session researcher continued to prompt the child through the steps of each task analysis until the target activity was complete. Engagement and problem behavior data collection ended after 5 (Xander, Raven, Marc) or 10 min (Jason, Michael), even if children had not completed required tasks; prompting to complete the visual support task analysis continued until the child completed the target activity/task. The tasks on each child's visual support are displayed in Table 2.

Planned modifications. Preferred images were placed at each of the four locations in the

morning routine prior to the start of the session during the VAS planned modification phase of the visual support intervention for Marc. During pre-sessions, the pre-session researcher told Marc, "Today you are going to use your schedule. As you go to the places in your morning routine, you will find *Ben 10© aliens*. When you find an alien, you can look at it, then put it in the all done bag. When you finish your morning routine, you can look at the aliens in the bag when you play with Legos if you want." The pre-session researcher showed Marc an example alien and modeled looking at the image, then placing it in the plastic 'all done' bag at the bottom of the schedule. During the session, the session researcher did not prompt Marc to take the alien images. Rather, the session researcher delivered a gestural prompt to place the aliens in the "all done" bag using a 5 s delay interval that started only if Marc picked up an alien image from each of the four morning routine locations. If Marc took an alien image out of the bag during the morning routine, the session researcher did not contingently respond; the researcher continued implementing the task analysis procedures as planned.

Generalization sessions. Generalization sessions occurred during activities or routines selected by each classroom teacher during which the target children exhibited low engagement. The format of visual supports matched the format during intervention: VAS (Xander, Raven, Marc), SWB (Jason), and structured visual cues (Michael). Generalization sessions occurred during the writing center (Xander), math centers (Jason), spelling center (Raven), morning meeting (Marc), and arrival centers (Michael). The researcher placed the visual support in the assigned location and told the child, "you can use this during (activity name)." Then the researcher positioned the video camera and recorded the session for 5 min (Xander, Raven, Marc) or 10 min (Jason) per the length of each child's planned sessions. Generalization sessions were 5 min, rather than 10 min (his typical session length) for Michael because arrivals centers

were only 5 min in duration, the length of time between Michael completing breakfast and the initiation of the morning meeting activity. The researcher did not interact with the child during generalization sessions. When the timer on the camera indicated the session was complete, the researcher ended the session and collected the visual support.

Interobserver Agreement

Interobserver agreement (IOA) data were collected for 100% of sessions across conditions and participants for engagement and problem behaviors; IOA data were collected for at least 33% of sessions across participants and conditions for correct completion behaviors (Ayres & Ledford, 2014). Reliability data were collected via video using ProCoderDV (Tapp, 2003). Reliability data for child completion of visual supports task analyses procedural steps were collected via paper and pencil recording (see Figure 3). Reliability data were collected by observers blind to study purpose, hypothesis, and condition for designs evaluating social stories interventions; observers were not blind to condition for designs evaluating visual support interventions. IOA was calculated using point-by-point agreement for each dependent variable using the following formula [agreements/(agreements + disagreements) x100)].

The primary researcher trained reliability observers prior to beginning the study. Four reliability observers were trained: two on engagement and out of location behaviors, one on inappropriate peer interaction behaviors, and three on correct completion behaviors. The correct completion observers coded across all participants; the inappropriate peer interactions observer coded all sessions for Jason and Michael. One observer coded engagement and out of location behaviors for all participants except Jason; the final observer coded engagement and out of location behaviors for Jason. Each reliability observer was a graduate student in early childhood special education.

Observers were provided with written examples and nonexamples of each dependent variable (engagement, problem behaviors, and correct completion). The primary researcher reviewed behavioral definitions, examples, and nonexamples with observers, then coded a video of each condition with observers. Criterion for training was at least 90% agreement for 2 videos for each behavior. Discrepancy discussions occurred after each session in which agreement was not 100% across the primary and secondary observers. Second observer data was graphed alongside primary data to detect potential observer bias (Ledford & Wolery, 2013).

Procedural Fidelity

Procedural fidelity (PF) data were collected using direct systematic observational recording via video for at least 33% of sessions across participants, conditions, implementers, and behaviors using the forms displayed in Figures 1, 2, and 3. Overall fidelity for each session was calculated by dividing the number of correctly implemented behaviors by the total number of expected behaviors and multiplying the quotient by 100. PF data were collected approximately every third session; sessions in which data were collected were determined by a random number generator. Fidelity data were collected by an independent observer who was not implementing the session. The fidelity coder was trained by the primary researcher by (a) providing written definitions of expected implementer behaviors by condition and (b) evaluating PF in a mock video for each condition. Criterion for training was 100% agreement with the primary researcher across 2 videos per condition across both studies. Expected behaviors during visual support task analysis implementation using CTD procedures are displayed in Table 5. Expected behaviors during pre-sessions and sessions across baseline, social story, and visual supports conditions are displayed in Table 6.

Social Validity

The social validity of the social stories and visual supports interventions were evaluated via child preference for intervention format and information gathered from blind raters assessing the acceptability and feasibility of a series of interventions commonly used in classrooms. Additionally, normative comparison data were collected to evaluate the social validity of child outcomes during intervention for Xander and Raven.

Child preference. The social validity of social stories and visual support interventions were evaluated via child preference for intervention presentation format (e.g., book, traditional, digital) as assessed by a MSWO preference assessment. Assessing child preference for instructional materials provided a measure of participant acceptance of the intervention format. Child preference also provided information about how participant preference and choice of intervention materials could be incorporated into individualized interventions.

Stakeholder attitudes. The acceptability and feasibility of both interventions were evaluated by asking teachers of child participants to assess social stories and visual supports in relation to other commonly used low-effort classroom interventions: weighted blankets, social stories, visual schedules, headphones, weighted vests, alternative seating, token boards, first/then boards, timers, work boxes, response cards, point sheets, and choice boards. Three teachers completed the survey because both first graders and both preschoolers were in the same classroom. Teachers were provided with a brief description of each intervention and asked to (a) sort interventions into three categories: effective, ineffective, effectiveness unclear and (b) identify the three interventions they would be most likely to use and three interventions they would be least likely to use (see Appendix H). Teachers were also asked to place the interventions from easiest to hardest to implement on a number line continuum. Teachers were

asked to complete the survey *before* data collection or discussion of interventions so they could serve as blind raters of treatment acceptability and feasibility; however only one of three teachers completed the survey before the start of intervention. All teachers completed the survey before data were shared regarding the effectiveness of each intervention. This social validity measure provided information about the attitudes of stakeholders toward commonly used, low-effort interventions reported to improve child outcomes in school settings.

Normative comparisons. Social validity data were collected via normative comparisons of target child participants to typically developing peers in the same classroom for Xander and Raven. Prior to initiation of the study, researchers asked classroom teachers rank all students in the classroom from lowest to highest overall engagement during the targeted task (e.g., whole group reading and math instruction; Appendix C). One peer from the middle of the class rank was selected by researchers as a peer participant for normative comparison data collection; Xander and Raven had the same peer comparison as both participants were in the same classroom. Days in which normative comparison data were collected were randomly selected. Normative comparison sessions occurred simultaneously during sessions across conditions; a video camera was mounted on a classroom shelf to record the peer selected for normative comparison data collection. Comparison data were collected on the engagement and problem behavior behaviors during each comparison using the same response definitions and procedures as target participants. Normative comparison data provided an assessment of the social validity of outcomes by using visual analysis to compare the levels of engagement and problem behavior for target child participants and normative comparison peers. Socially valid behavior change will have occurred if the levels of engagement for target child participants are similar to or exceed the level of peer comparisons during intervention conditions. Similarly, if levels of problem behavior

for target child participants were similar to or lower than peer comparisons during intervention conditions (e.g., social story, visual supports), then social story and/or visual supports interventions resulted in socially valid behavior change.

CHAPTER III

RESULTS

Preference Assessments

Participant preference of intervention format across both social story and visual supports interventions are displayed in Table 2. Xander, Jason, and Raven preferred the digital format social story; Xander and Raven also preferred the digital format VAS. Michael preferred the traditional social story format. Marc did not indicate a clear preference for social story intervention format, thus the teacher selected the format she would be more likely to use: a single page story. Marc and Michael both preferred the traditional VAS format. Preference for SV format was not assessed for Jason or Michael.

Social Stories Comparison

Engagement. Engagement data during the social stories comparison are presented across participants in the top panels of Figures 12-16. Engagement data during the social stories comparison are discussed by participant below.

Xander displayed low levels of engagement between 0-45% of intervals during the initial baseline condition. Engagement immediately increased in level to around 80% of intervals (SSRC) and 30% of intervals (SS) during the initial social story conditions sessions, then returned to 0 levels for the remaining sessions across both conditions. Levels of engagement during no-intervention conditions were variable between 0-60% of intervals (book alone; BA) and 0-70% of intervals (baseline). There was considerable overlap between social story and no-intervention conditions with levels of engagement lower in the SS and SSRC conditions

compared to the no-intervention conditions at the end of the comparison. A functional relation between social stories interventions and engagement behaviors was not present due to the absence of differentiation between conditions.

Jason displayed variable engagement during the initial baseline condition between 20-80% of intervals. Engagement levels were similar to the initial baseline conditions when social stories interventions were implemented. Engagement remained between 20-70% of intervals across all social stories (SS, SSRC) and no-intervention (BL, BA) conditions; there was no differentiation and considerable data overlap between all conditions. A functional relation between social stories interventions and engagement behaviors was not present due to the absence of differentiation between conditions.

Raven displayed variable engagement during the initial baseline condition between 0-60% of intervals. Engagement remained at 0 levels during the SSRC condition at intervention onset, then increased to a stable level around 60% of intervals for the remaining sessions. Engagement had a small increase in level to approximately 70% of intervals when the SS condition was implemented, but engagement decreased during the remaining sessions to around 20% of intervals. Engagement during no-intervention conditions remained between 40-75% of intervals (BA) and 45-50% of intervals (BL). Overlap between intervention and no-intervention conditions was present across the comparison. A functional relation between social stories interventions and engagement behaviors was not present due to the absence of differentiation between conditions.

Marc did not engage with the morning sign in routine during the initial baseline condition with the exception of one session with approximately 50% engagement. When the social stories intervention conditions were implemented, engagement remained at 0% for the first 2 sessions in

each condition (SS, SSRC). Engagement behaviors increased to around 30% during the third session of each condition, then displayed a decreasing trend to 0% for the remainder of the comparison. Overlap between intervention and no-intervention conditions was present across the comparison. A functional relation between social stories interventions and engagement behaviors was not present due to the absence of differentiation between conditions.

Michael displayed stable engagement between 30-50% of intervals during the initial baseline condition. When social stories interventions were implemented, Michael's level of engagement remained stable between 40-50% of intervals for the first two SS sessions, then decreased to approximately 20% engagement for the final session. Engagement initially decreased to around 20% during the initial SSRC session, then increased to levels similar to the initial baseline condition between approximately 40-50% of intervals. Engagement during no-intervention conditions (BA, BL) ranged between 20-50% of intervals. Overlap between intervention and no-intervention conditions was present across the comparison. A functional relation between social stories interventions and engagement behaviors was not present due to the absence of differentiation between conditions.

Problem behavior. Out of location and inappropriate peer interactions data are displayed across participants in the middle and bottom panels of Figures 12-16. Problem behavior data in the social stories comparisons are discussed by participant below.

Out of location. Xander displayed a variable duration of time out of location between 100-300 s during the initial baseline condition. When social stories interventions were implemented, the level of out of location behaviors immediately increased in the SSRC condition, then increased to 300 s out of location by the end of the comparison. Xander displayed stable levels of out of location behaviors around 100 s during the SS condition. Out of location

behaviors continued to be variable during the comparison in the BL no-intervention condition (approximately 5-300 s), but remained low at approximately 10-50 s during the BA no-intervention condition. Overlap between intervention and no-intervention conditions was present across the comparison. A functional relation between social stories interventions and out of location behaviors was not present due to the absence of differentiation between conditions.

Jason displayed low levels of out of location behaviors (approximately 10-250 s) during the initial baseline condition that continued during the social stories comparison. When social stories interventions were implemented, Jason's time out of location decreased to near 0 s for most of the SSRC condition with one outlying data point around approximately 350 s. Out of location behaviors remained at levels similar to the initial baseline condition during the SS condition (approximately 100-150 s). Time out of location during the BA no-intervention condition remained around 0-50 s with an increase to approximately 100 s at the end of the comparison. Overlap between intervention and no-intervention conditions was present across the comparison. A functional relation between social stories interventions and out of location behaviors was not present due to the absence of differentiation between conditions.

Raven displayed variable levels of out of location behaviors during the initial baseline condition (approximately 25-300 s). Out of location behavior immediately increased to 300 s during the initial SSRC session, then decreased to around 20 s for the remaining SSRC conditions. Out of location behavior was variable during the SS condition between approximately 50-200 s. Out of location behavior was stable during no-intervention conditions around 50-75 s (BL) and 50-100 s (BA). Overlap between intervention and no-intervention conditions was present across the comparison, although the total duration of time Raven spent out of location was lower in the SSRC condition compared to the no-intervention conditions

(BA, BL) at the end of the comparison, resulting in some differentiation between conditions. A functional relation between SSRC and out of location behaviors may be present, although confidence is weakened by the presence of overlap between initial sessions.

Marc was out of location during the entire duration (300 s) of the initial baseline session. His level of problem behavior decreased near 0 s during the second session, then increased and remained stable at 300 s for the remaining initial baseline sessions. When social stories conditions (SS, SSRC) were implemented, the total duration of time Marc was out of location did not change and remained at 300 s during the first two sessions of each condition. The total time out of location decreased to around 100 s, then returned to 300 s in the SSRC condition. The SS condition also resulted in a decrease in level of total time during the third session (approximately 175 s), returned to 300 s, then decreased again to approximately 225 s during the final SS session. Marc's total duration out of location remained stable at 300 s for all no-intervention BL sessions during the SS comparison. Out of location behaviors remained at 300 s during the first three BA no-intervention sessions, then decreased to approximately 75 s in the final session. Overlap between intervention and no-intervention conditions was present across the comparison. A functional relation between social stories interventions and out of location behaviors was not present due to the absence of differentiation between conditions.

Michael had variable time out of location during the initial baseline condition between approximately 0-225 s. When social stories conditions (SS, SSRC) were implemented, Michael's total time out of location remained stable around approximately 50 s in the SSRC condition. Total time out of location was variable in the SS condition between approximately 10-400 s. Time out of location remained stable between 0-100 s (BL) and approximately 0-20 s (BA) in no-intervention conditions. Overlap between intervention and no-intervention conditions was

present across the comparison. A functional relation between social stories interventions and out of location behaviors was not present due to the absence of differentiation between conditions.

Inappropriate peer interactions. Jason engaged in 0-10 inappropriate peer interactions during the initial baseline condition. When social stories intervention conditions were implemented, interactions remained stable between 0-2 (SSRC) and 4-5 (SS) inappropriate interactions. The total number of interactions decreased to 0 then increased to approximately 8 interactions during the final SS sessions. However, the number of inappropriate peer interactions increased in level during the remaining SSRC conditions to 35 and 15 interactions. Inappropriate interactions during the no-intervention conditions were variable between approximately 0-28 interactions (BL) and 2-15 interactions (BA). Overlap between intervention and no-intervention conditions was present across the comparison. A functional relation between social stories interventions and inappropriate peer interaction behaviors was not present due to the absence of differentiation between conditions.

Michael displayed low levels of inappropriate peer interactions in the initial baseline condition (0-2 interactions). When social stories intervention conditions were implemented, interactions remained low and stable in both conditions, with an increasing trend in the final session of the SSRC condition to approximately 8 interactions. Inappropriate interactions during both of the no-intervention conditions were stable at near 0 levels. Overlap between intervention and no-intervention conditions was present across the comparison. A functional relation between social stories interventions and inappropriate peer interaction behaviors was not present due to the absence of differentiation between conditions.

Visual Supports Comparison

Engagement. Engagement data are displayed across participants in the top panels of

Figures 12-16. Engagement data during the visual supports comparisons are discussed by participant below.

Xander displayed an immediate increase in his level of engagement when the VAS intervention was implemented to approximately 55% of intervals, followed by an increasing trend across the condition to approximately 90% of intervals. Engagement remained stable around 80% of intervals during the best alone condition. Engagement during the no-intervention (BL) condition displayed an increasing trend to approximately 65% of intervals during the first three sessions. Engagement was variable during the remaining no-intervention (BL) sessions between 0-60% of intervals. There was some overlap between VAS and BL conditions (two data points), although there was clear differentiation between conditions as the comparison continued. A functional relation between VAS intervention and engagement behaviors was present due to differentiation between conditions with higher and more stable levels of engagement occurring in the VAS condition compared to the no-intervention condition.

Jason displayed an immediate increase in engagement behaviors when the SWB intervention was implemented to around 90% of intervals. Engagement remained stable around 90% of intervals throughout the SWB condition except for one session in which engagement behaviors decreased to near 60% of intervals. During the best alone condition engagement behaviors were stable between approximately 80-90% of intervals engaged. Engagement during the no-intervention (BL) condition was variable between 10-60% of intervals. There was one data point that overlapped between SWB and BL conditions (around 60% of intervals); all other data points were differentiated. A functional relation between SWB intervention and engagement behaviors was present due to clear differentiation between conditions with higher levels of engagement occurring in the SWB condition compared to the no-intervention condition.

Raven's level of engagement immediately increased in level and remained stable around 75% of intervals during the VAS condition and continued during the best alone condition. Engagement was stable between approximately 35-45% of intervals during the no-intervention (BL) condition. There was no overlap between VAS and no-intervention BL conditions. A functional relation between VAS intervention and engagement behaviors was present due to clear differentiation between conditions with higher levels of engagement occurring in the VAS condition compared to the no-intervention condition.

Marc's level of engagement was at levels similar to the social stories comparison (around 25% of intervals engaged) when the VAS intervention was implemented. Engagement behaviors increased in level after the second VAS intervention session, but remained variable between 45-90% of intervals. Engagement was low and stable during the no-intervention BL condition (0-20% of intervals). There was no overlap between VAS and no-intervention BL conditions. A functional relation between VAS intervention and engagement behaviors was present due to clear differentiation between conditions with higher levels of engagement occurring in the VAS condition compared to the no-intervention condition. When the VAS + preferred images modification was implemented, engagement immediately increased in level to approximately 90% of intervals, similar to the highest levels of the VAS intervention. Engagement remained high and stable in the VAS + preferred images condition during the best alone condition. Levels of engagement in the no-intervention (BL) condition were stable at low levels (less than 40% of intervals) then decreased to near 0% engagement. There was no overlap between VAS + preferred images and no-intervention BL conditions. A functional relation between VAS + preferred images intervention and engagement behaviors was present due to clear differentiation between conditions with higher levels of engagement occurring in the VAS + preferred images

condition compared to the no-intervention condition.

Michael displayed stable levels of engagement behaviors around approximately 55% of intervals when the VAS intervention was implemented. Baseline levels of engagement were consistently lower than VAS levels around approximately 25-40% of intervals. There was no overlap and clear differentiation in levels of engagement between VAS and no-intervention BL conditions. A functional relation between the VAS intervention and engagement behaviors was present due to clear differentiation between conditions with higher levels of engagement occurring in the VAS condition compared to the no-intervention condition. When the SV modification was implemented, Michael's level of engagement immediately increased compared to the VAS condition to around 80% of intervals. Engagement decreased during the fourth SV session, but immediately increased during the remaining sessions to around 70% of intervals. Engagement during the no-intervention BL condition was stable around approximately 20-40% of intervals. There was no overlap between SV and BL conditions. A functional relation between the SV intervention and engagement behaviors was present due to clear differentiation between conditions with higher levels of engagement occurring in the SV condition compared to the no-intervention BL condition.

Problem behavior. Out of location and inappropriate peer interactions data are displayed in the middle and bottom panels of Figures 12-16. Problem behavior data during the visual supports comparisons are discussed by participant below.

Out of location. Xander displayed low levels of out of location behaviors when the VAS intervention was implemented that decreased to 0 s during the second and third sessions. Data increased to approximately 125 s out of location during the fourth VAS session, then returned to 0 s and remained stable during the best alone condition. Out of location behaviors were variable

in the no-intervention (BL) condition with an increasing trend in the first four sessions to approximately 240 s. Data were variable for the remaining two sessions between approximately 50-290 s. There was overlap between VAS and no-intervention (BL) conditions for three of the five data points in the VAS condition during the comparison. Although data stabilized at 0 s during the best alone condition, a functional relation between the VAS intervention and out of location behaviors was not present due to the absence of consistent differentiation between conditions.

Jason displayed an immediate decrease in out of location behaviors when the SWB intervention was implemented to near 0 levels. His total time out of location remained stable near 0 s for the remainder of the VS comparison and best alone conditions. Out of location behaviors were variable in the no-intervention BL condition between 0-145 s. There was some overlap between SWB and BL conditions, but data were consistently lower in the SWB intervention compared to the BL condition. A functional relation between the SWB intervention and out of location behaviors was present due to consistently lower levels of out of location behaviors occurring in the SWB condition compared to the no-intervention BL condition. Confidence in the strength of this functional relation may be decreased given the overlap between conditions.

Raven displayed an immediate decrease in the total time out of location when the VAS intervention was implemented to near 0 levels. Her total time out of location remained stable near 0 s for the remainder of the VS comparison and best alone conditions. Out of location behaviors were stable around 120 s during the no-intervention (BL) condition. There was no overlap between the VAS and BL conditions. A functional relation between the VAS intervention and out of location behaviors was present due to clear differentiation between conditions with lower levels of out of location behaviors occurring in the VAS condition

compared to the no-intervention BL condition.

Marc displayed an immediate decrease in the total time out of location when the VAS intervention was implemented to around 90 s. A decreasing trend continued throughout the condition to 0 s out of location. Total time out of location was variable in the no-intervention BL condition between approximately 120-300 s. There was no overlap between VAS and BL conditions. A functional relation between the VAS intervention and out of location behaviors was present due to clear differentiation between conditions with lower levels of out of location behaviors occurring in the VAS condition compared to the no-intervention BL condition. When the VAS + preferred images condition was implemented, out of location behaviors remained low near 0 s except in the fourth session (near 25 s). Time out of location was slightly higher in the no-intervention BL condition than the VAS + preferred images condition with some condition overlap, although the first data points in each condition are within 3 s of each other. A functional relation between VAS + preferred images and out of location behaviors is not present due to the absence of consistent differentiation between conditions.

Michael displayed low levels of out of location behaviors in the baseline condition (approximately 0-20 s) during both visual support comparisons. When the visual supports intervention conditions were implemented, out of location behaviors remained low and stable across both VAS and SV conditions. Overlap between intervention (VAS, SV) and no-intervention (BL) conditions was present across the comparison. A functional relation between visual supports interventions and out of location behaviors was not present due to the absence of differentiation between conditions.

Inappropriate peer interactions. Jason displayed an immediate decrease in the number of inappropriate peer interactions to near zero levels when the SWB intervention was implemented.

Inappropriate peer interactions remained low in all SWB sessions except one, in which seven inappropriate interactions occurred. Levels returned to zero and remained stable during the best alone condition. The number of inappropriate peer interactions were variable during the no-intervention (BL) condition (5-40 interactions). There was one overlapping data point between the SWB and BL conditions; the remaining data were differentiated. A functional relation between SWB intervention and inappropriate peer interactions was present due to consistently lower levels of inappropriate peer interactions in the SWB intervention condition compared to the no-intervention condition.

Michael displayed low levels of inappropriate peer interactions in the no-intervention BL condition (0-2 interactions) across the VAS comparison until the final session (approximately 15 interactions). When the visual supports intervention conditions were implemented, interactions remained low with an increase to approximately four interactions in the final VAS session; interactions decreased and were stable at zero interactions during the SV condition. Overlap between intervention and no-intervention conditions was present across the comparison. A functional relation between visual supports interventions and inappropriate peer interaction behaviors was not present due to the absence of differentiation between conditions.

Correct Completion

Visual activity schedules. Correct completion of visual support task analyses data are displayed in Table 8. All participants independently located the correct icons, but neither Xander nor Raven independently swiped the icons to the completed column in the iPad application. Although only measured during three sessions, Michael also did not independently remove icons when tasks were complete. Marc, however, independently removed the icons when the tasks were completed. Marc also independently moved his VAS to each location during the morning

routine.

Structured work boxes. Jason independently removed work items from their bins and initiated work tasks. However, Jason had variable performance returning items to the work boxes during the final SWB condition and needed a prompt despite his independent use of the SWB in the previous two sessions.

Structured visual supports. Michael independently manipulated components of the structured visual support book during morning meeting. He consistently used the counting chart independently and transitioned between counting and the peer attendance roster independently. However, he continued to require prompting to use the visuals related to content instruction on clothing (e.g., types of clothing, community helpers' clothing, clothing stores).

Generalization

Generalization data are displayed in Table 8. Xander and did not generalize use of the VAS to the writing center (Xander) or morning meeting (Marc). Raven did not consistently use the VAS during the spelling center. During 2 sessions she used the VAS with 100% accuracy, but during another 2 sessions she did not use the VAS at all. Only one generalization session was conducted with Jason; he used the SWB during math centers with 72% accuracy. Similar to intervention sessions, Jason did not return the materials to each box. Michael did not generalize structured visual use to arrival centers.

Interobsever Agreement and Procedural Fidelity

IOA data for engagement and problem behaviors and PF data are displayed in Table 7. Average agreement across participants and conditions for engagement and out of location behaviors met contemporary standards. Agreement ranges for inappropriate peer interactions for Jason included four calculations below contemporary standards (50-70% agreement); agreement

for one calculation for Michael was below contemporary standards (0% agreement; see Table 7). During these sessions Jason and Michael engaged in inappropriate peer interactions at low rates; no more than one instance (Michael) or two (Jason) instances of disagreement occurred in any of these sessions. Average fidelity across baseline, social stories, and visual supports conditions met contemporary standards (see Table 7).

IOA data were collected for correct completion behaviors in at least 33% of sessions across participants. Average agreement across participants was 100% for Xander and Raven, 98.6% for Marc (range 95.83-100%), 96.1% for Michael (range 94-100%), and 96% for Jason (range 88-100%). IOA and PF data were collected for 67% of preference assessments across participants with 100% IOA and PF across all sessions.

Observer bias analysis. Second observer data across participants are displayed as the red data pathways in Figures 12-16. The likelihood of bias is described for each comparison below.

Social stories comparison. Visual analysis of primary and secondary observer data indicated the likelihood of bias was low across all participants for engagement and problem behaviors. There were no patterns of systematic over- (social stories conditions) or under- (no-intervention BL and BA conditions) estimation of engagement levels by the primary observer. Similar conclusions regarding the absence of functional relations could be drawn in both the primary and secondary observer data.

Visual supports comparison. Visual analysis of primary and secondary observer data indicated the likelihood of bias was low across all participants for problem behaviors. The likelihood of bias was also low for engagement behaviors for Xander, Jason, Marc, and Michael (VAS comparison only). There were no patterns of systematic over- (social stories conditions) or under- (no-intervention BL and BA conditions) estimation of engagement levels by the primary

observer. Similar conclusions regarding the absence of functional relations could be drawn in both the primary and secondary observer data. However, observer bias may have occurred during the visual supports comparison for Raven and the structured visuals comparison for Michael. The primary observer consistently recorded higher levels of engagement in the intervention condition (VAS Raven, SV Michael) and consistently lower levels of engagement in the no-intervention condition (BL). However, conclusions regarding the absence of a functional relation were similar across both primary and secondary observer data, suggesting the likelihood of observer bias did not impact conclusions regarding the presence of an effect.

Social Validity

Peer comparisons. Levels of engagement for the peer comparison are displayed in Figures 12 (Xander) and 13 (Raven). Xander's peer displayed variable engagement across all comparisons with levels ranging between 0-80% engagement. Engagement during 7 of 8 peer comparison sessions was between 30-80% for Xander's peer. During social stories conditions, Xander's engagement (0-5% engagement) was lower than that of the peer (50-80% engagement), indicating social stories did not produce meaningful changes in the level of engagement Xander displayed during whole group reading. When the VAS was present, Xander was engaged with instruction in 60-90% intervals, whereas the peer comparison was engaged in 0-80% of intervals. Xander's engagement was also higher in level during the best alone condition (range 80-85% of intervals) compared to approximately 35% of intervals for his peer. Thus, the presence of the VAS resulted in socially valid improvements in engagement for Xander that exceeded the level of and resulted in less variable performance than that of his peer.

Engagement levels for the peer comparison for Raven were also variable across all comparisons (range 0-60% engagement). During the SS condition, Raven was engaged at levels

lower than her peer (peer engagement was around 50% of intervals). However, Raven's level of engagement around 60% of intervals during the SSRC exceeded that of her peer (approximately 50% of intervals), but was undifferentiated from the no-intervention book alone condition. Thus, Raven's performance without intervention met or exceed that of her peer during the social stories comparison. When the VAS was present, Raven engaged with whole group math instruction at levels similar to or exceeding her peer (at or above 60% engagement) across all VAS sessions. Unlike the social stories comparison, Raven displayed stable levels of engagement at or above her peer, suggesting the presence of VAS resulted in socially valid improvements in engagement.

Stakeholder surveys. Three general education teachers in a preschool, kindergarten, and first grade classroom completed the stakeholder surveys. Teachers had been in their current positions for 0.5-11 years and had 7-11 years of experience teaching in schools. Responses to the survey are displayed in Table 9. All three respondents rated social stories and visual schedules as effective. Two teachers rated work boxes as effective; one indicated she was unsure if work boxes were effective. Teachers also indicated social stories and visual supports were feasible for use in their classrooms. Two teachers further noted they would be very likely to implement social stories relative to other commonly used antecedent interventions such as token boards, visual supports, and sensory-based interventions. No teachers rated either visual support (schedules or work boxes) as an intervention they were most likely to implement compared to the other antecedent interventions listed in the survey. Additionally, work boxes were rated by all three teachers in the third and fourth quartiles of feasibility, indicating teachers may not find implementation of structured visual supports feasible in the context of general education classrooms. Finally, one teacher indicated visual schedules would be the last antecedent intervention she would implement in her classroom. Overall, teachers rated social stories as more

feasible and more likely to be implemented than visual supports interventions.

CHAPTER IV

DISCUSSION

This study contributed to the existing literature by providing the first evaluation of the effectiveness of social stories for children at-risk for EBD, the first evaluation of the effectiveness of SWB for children at-risk for disability, and the first incorporations of participant preference in intervention format for both social stories and visual supports. Conclusions are discussed below in relation to the existing literature, the impact of instructional settings and intervention format on intervention effectiveness, and the effectiveness of CTD as a procedure to teach independent use of the visual supports.

Results of this study suggest social stories are not an effective intervention for improving engagement behaviors or decreasing problem behaviors during ongoing instructional activities and routines for children at-risk for EBD in general education preschool and elementary settings. These conclusions mirror those of some prior studies evaluating their effectiveness for children with (Leaf et al., 2015) and without (Zimmerman & Ledford, 2017) ASD. Conversely, results from this study differ from previous research in which social stories with comprehension questions were effective at improving on-task behaviors of children with language impairments during lunchtime routines (Schneider & Goldstein, 2009). It may be that social stories could be more effective for routines rather than instructional activities, although the absence of improvements in the morning routine for Marc suggest this may not be the case. Given the social stories evaluation was a systematic replication of Schneider and Goldstein (2009), future studies should evaluate the effectiveness of social stories with and without comprehension questions in

improving routines with other children with and at-risk for disability.

In contrast, visual supports may be an effective intervention for improving engagement behaviors in children at-risk for EBD. The frequency and variability of problem behaviors may also be decreased when visual supports are present, although these changes were not replicated across all participants. These outcomes are consistent with the only other evaluation of visual supports for children at-risk for disability (Zimmerman, Ledford, & Barton, 2017). Specifically, the level and variability of problem behaviors decreased for all participants during visual supports conditions except for Michael. His out of location and inappropriate peer interaction behaviors were at relatively low levels across all conditions, thus changes in behaviors were not observed contingent on intervention implementation. Variability in children's engagement performance decreased for all participants except Marc, suggesting consistency of children's performance may increase when visual supports are present.

On the contrary, although the overall level of Marc's engagement increased in the presence of the VAS, his performance was more variable relative to no-intervention conditions. Differences in Marc's performance relative to the other participants may be explained by his limited previous experiences at school and the need for modifications to visual supports for some children. Unlike the school-aged participants, intervention did not begin for Marc until the second semester of the school year. His limited five-month learning history did not include the morning routine as a component of the school day (his teacher reported he had never been observed to engage in the routine prior to the study). Thus, presenting a visual support to a young child for whom his school experience did not include engaging in the targeted activity may have been insufficient to result in meaningful behavior change. The variability observed in Marc's performance could have been a result of the intermittent success of the intervention in changing

the contingencies associated with school arrival. Children with limited learning histories, particularly those for whom school has not been associated with successful completion of activities or routines, may require modifications to existing visual support protocols. Incorporating child preference as an antecedent modification stabilized Marc's engagement at high enough levels for him to successfully and independently complete the morning routine.

Differences in children's performance were also observed relative to the type of activity targeted by the visual support. The presence of VAS resulted in increases in engagement for Xander and Raven during whole group reading and math instruction, respectively, that met or exceeded that of a typical peer in their classroom. However, VAS did not result in sufficient improvements in Michael's levels of engagement during the whole group morning meeting activity. The variability in the effectiveness of the VAS may be due to the age of participants (Michael was in preschool whereas Xander and Raven were first grade students), but may be more likely due to the format of each whole group activity. Whole group instruction in Xander and Raven's class was relatively short and served to briefly introduce content whereas whole group instruction in Michael's class was longer in duration and involved multiple instructional activities. Simply providing visual structure to the order of the activities was insufficient for meaningful behavior change. Thus, VAS may be better suited for a single whole group activity of a short duration rather than multiple activities that culminate in a longer duration whole group instructional session. Researchers should continue investigation of under what conditions the use of VAS during large group activities is likely to result in improved outcomes.

SV, however, resulted in improvements in children's engagement across independent reading centers and whole group instruction. SV in the form of work boxes functioned as an organizational tool for Jason to collect independent center materials whereas they functioned as

visual supports to increase Michael's methods to respond to instruction during morning meeting. Increasing children's opportunities to respond has been demonstrated to be an effective way to improve academic outcomes (Sutherland & Wehby, 2001), thus SV may be a low-effort way to improve engagement for children at-risk for disability as well as children with developmental disabilities (Zimmerman, Ledford, & Severini, 2018). Future studies investigating the utility and flexibility of SV formats (e.g., boxes versus books) are needed to guide selection of SV interventions across multiple instructional arrangements.

Although visual supports yielded overall positive improvements in engagement for all participants, all children required some prompting to use the supports throughout the study. Similar to previous research using CTD to teach VAS use to children at-risk for social delays (Zimmerman, Ledford, & Barton, 2017), none of the children acquired independent completion of all task analysis steps for the VAS because some required prompting to move icons to a 'finished' position on the iPad (Xander, Raven). However, Marc independently removed all icons and placed them in the 'finished' bag after task completion. Xander and Raven may have simply needed to see the icons to cue them to listen for questions and opportunities to respond to instruction, rather than manipulate the icons to successfully complete the tasks associated with whole group instruction. Marc, however, may have required the removal of each icon to signal when he was finished with each step of the routine. The variability among participants may have been due to the participants' ages (Marc was in preschool whereas Xander and Raven were in first grade), but previous research with preschool children at-risk for disability also found icon removal was not an essential step in the task analysis process (Zimmerman, Ledford, & Barton, 2017). Thus, removal of icons may be attributed to participant preference rather than age. The continued need for prompting may also be due to the relatively short duration of the study: each

child had fewer than five opportunities to independently manipulate their schedules at the terminal delay intervals. Future studies investigating child preference for icon removal as well as studies investigating the efficiency of independent schedule use with and without removable icons may provide further information about the critical components of VAS use for children at-risk for disability.

Limitations and Future Directions

Although the current study provided novel investigations of the use of social stories and visual supports with children at-risk for disability in general education classrooms, results should be considered in light of some limitations. First, social stories and visual supports were not directly compared in the current study; thus comparative conclusions cannot be experimentally drawn. Levels of engagement when social stories were implemented were comparable to or lower than those of no-intervention conditions (BL and BA), thus performance in a continued baseline no-intervention condition could be reasonably considered similar to that of a social story condition. Additionally, children in the current study were not appropriately engaging in instructional activities and routines, and missing instructional content for at minimum 15 days prior to the visual supports condition. As a result, researchers decided not to continue to evaluate conditions in which meaningful behavior change had not occurred for experimental purposes (social story to visual support). Moreover, neither intervention had been evaluated in the context of general education classrooms for this population of children. Comparing the interventions to each other without evidence demonstrating either may be effective would have been premature. Comparing each intervention to a no-intervention baseline condition, rather than each other, allowed the current study to first demonstrate the potential effectiveness of each intervention. Finally, if carryover effects were present, it would have appeared that both interventions were

effective whereas if carryover effects were present in baseline, one would be more likely to identify the threat. Future studies should be conducted to compare the interventions or evaluate the effectiveness of the interventions as a combination package similarly to Schneider and Goldstein (2010); this comparison was outside the scope of the current study.

Additionally, all sessions were implemented by research staff rather than teachers or paraprofessionals in the classrooms. The feasibility of implementing VAS or SWB with children at-risk for disability has not yet been determined, nor has the feasibility of appropriate tool selection. Although structured guidelines were followed by the researcher in collaboration with the teacher when selecting the visual supports, icon formatting and content were created by the researcher. Furthermore, stakeholder survey results indicated some teachers may rate VAS as difficult to implement relative to other antecedent interventions. When VAS were used, teachers preferred traditional paper formats whereas children preferred digital formats. Additional surveys of teacher preferences in intervention format as well as intervention selection may provide information about the likelihood of teacher use of interventions in non-preferred formats. Teacher preference for social stories over visual supports should also be further investigated to determine the components of each intervention that may be preferred by teachers, despite a lack of evidence to support their use. As further information about teacher preferences for antecedent interventions is gained, guidance about teacher selection of effective interventions like visual supports may begin to be created. Future studies should investigate the development of frameworks to guide teacher selection of visual supports based on child characteristics, the instructional setting, and teacher preference. Although teachers in this study reported they found VAS effective, the practicality of teachers creating, implementing, and assessing the effectiveness of visual supports has yet to be evaluated.

Limited evaluations of social validity and generalization of outcomes were conducted in this study. Improvements in engagement should be evaluated relative to peers in a child's classroom to ensure changes in engagement are meaningful in comparison to typical performance in a classroom. Insufficient measures of generalization also occurred in the study; generalization data were often not collected because the activity in which teachers reported the child needed additional assistance did not occur. Xander and Raven were often asleep during the morning center activities and Michael often arrived to school late, thus limiting his available time in arrival centers. Afternoon centers were also often cancelled in Jason's classroom, so only one generalization data point was collected.

Generalization of visual support use is critical to understanding how visual supports may function differently for children at-risk for disability compared to children with developmental disabilities. A previous study investigating the generalization of visual supports found children at-risk for disability did not generalize schedule use (Zimmerman, Ledford, & Barton, 2017), whereas multiple studies have demonstrated children with developmental disabilities generalize schedule use across novel stimuli (cf. Bryan & Gast, 2000; Pierce et al., 2013). Because VAS for children without developmental disabilities have often included elements of choice or cues to attend to opportunities to respond (i.e., answering questions for Xander and Raven), children may require explicit instruction to use schedules in novel settings in which the choices or opportunities to respond may vary. It may be possible that generalization of complex VAS designed to cue children to classroom contingencies such as opportunities to respond or opportunities for choice may be more complex than the generalization of VAS designed to display discrete activities to be completed. Studies exploring the generalizability of visual supports for children at-risk for disability may help teachers better plan for teaching schedule use

to all children in their classrooms.

Finally, although results from the current study replicate those of a previous study investigating the use of visual supports for children at-risk for disability, both were conducted by the same research team (Zimmerman, Ledford, & Barton, 2017). Additionally, the other evaluation of SWB in a general education whole group context was also conducted by the same research team (Zimmerman, Ledford, & Severini, 2018). There may be a component of the intervention that is specific to the researcher implementer that was present across all studies that is not captured in the procedures. Although the implementers (one of whom was not part of the previous studies) switched roles and differential results were not present, results should be interpreted cautiously until procedures have been replicated with other researchers or teaching staff. The effectiveness of CTD procedures to teach visual support use need to be evaluated with other research teams to determine if results replicate across other children at-risk for disability.

Despite these limitations the current study provided five demonstrations of the ineffectiveness of social stories and five demonstrations of the effectiveness of visual supports for improving engagement behaviors compared to no-intervention baseline conditions during ongoing instructional activities and routines for children at-risk for EBD in public, general education preschool and elementary classrooms. Although social stories and visual supports were both identified as feasible and acceptable low-effort interventions by general education teachers, the current study demonstrated that teachers may want to consider trying a visual support intervention prior to a social story intervention to see desired improvements in engagement behaviors for children at-risk for EBD in general education settings.

Table 1. *Participant Descriptions*

	Demographic Information							FAST	SSIS Scores[c]		
	Age[a]	Grade	Gender	Race	Disability Status	Family SES[b]	Academic Level[e]	Function	Social Skills	Problem Behavior	Academic Competence[d]
Target Participants											
Xander	7	1	M	AA	at-risk	at/below	below	A, T, E	4	98	6
Jason	6	K	M	AA	DD	at/below	below	A, E	8	89	2
Raven	6	1	F	AA	at-risk	at/below	below	A, E	<1	>99	30
Marc	5	PK	M	W	at-risk	above	on/above	A, T, E	8	98	-
Michael	5	PK	M	H	at-risk	at/below	on/above	A, T	8	80	-
Peer Comparison											
Kiara	7	1	F	AA	TD	-	on	-	22	73	37

Note. a=age presented in years. b=family income relative to the poverty line (U.S. Department of Health and Human Services Poverty Guidelines, 2017). c=scores presented as percentile ranks. d=scores not calculated for preschool children. e=teacher report of overall performance relative to grade level standards. FAST= *Functional Assessment Screening Tool* (Iwata & DeLeon, 1996). SSIS=*Social Skills Improvement System* (Gresham & Elliott, 2008), PB=problem behavior. K=kindergarten. PK=preschool. M=male. F=female. AA=African American. A=attention. T=tangible. E=escape. DD=developmental delay. W=white. H=Hispanic. TD=typically developing.

Table 2. *Intervention Descriptions*

				Social Story		Visual Support		
	Setting	Activity	Tasks	Format	History	Type	Format	History
Xander	WG	read aloud	(1) sit down (2) look at teacher (3-6) answer question (7) request drink of water or bathroom break	iPad	none	schedule	iPad	none
Jason	centers	reading centers[a]	(1) letter stamps (2) alphabet center (3) building CVC words (4) independent reading (5) writing (6) books	iPad	none	structured visuals (boxes)	3 27.9 cm x 31 cm x 10 cm boxes	none
Raven	WG	math	(1) sit down (2) look at teacher (3-6) answer question (7) choose to request drink of water or ticket	iPad	none	schedule	iPad	none
Marc	routine	morning arrival	(1) put away folder (2) hang up backpack (3) hang up coat (4) answer daily question (5) wash hands (6) sign in (7) legos	single page[b]	some use at home	schedule	linear strip	none
Michael	WG	morning meeting	(1) good morning song (2) counting (3) wish well (4) literacy song (5) content instruction (6) drink of water	single page	none	schedule	linear strip	none
			(1) song lyrics (2) chart 0-20 (3) attendance chart (4) alphabet chart (5) clothing images (6) drink of water			structured visuals (book)	book with 5-7 pages, 1 per task	none

Note. a=Jason completed one center per day, each with three activities (task 1, task 2, and reading books). b=selected format; no clear preference. WG=whole group. CVC=consonant vowel consonant words. Formats were selected by children via preference assessments.

Table 3. *Engagement Operational Definitions, Examples, and Nonexamples*

Behavior	Operational Definition	Examples	Nonexamples
Engaged	Appropriately participating in instructional content by (a) manipulating instructional materials (as designed or intended) (b) visually attending to materials or speaker with body oriented to speaker (c) responding to a task direction (d) responding to peer statement (e) walking during transition to designated location (f) appropriately waiting for next material or task direction from adult	(a) sorting objects into bins (b) looking at teacher during morning meeting (c) saying "July" when asked the month (d) saying, "no thank you" when asked to share markers (e) walking between cubby and sink during morning routine (f) seated at desk with hands to self and voice at volume of class while teacher is distributing worksheets	(a) shaking visual support materials (b) laying on back with legs in air with eyes looking at speaker (c) screaming "no" when asked to clean up (d) not responding to peer when asked to shake hands (e) running to toys after washing hands (f) yelling across table to peers while teacher is distributing materials
Unengaged	Failure to appropriately participate in classroom activities or routines by (a) engaging in problem behavior (b) failing to follow a task direction within 10 s (c) sitting appropriately in designed area, but failing to participate in opportunities to respond (d) leaving the designed instructional area (e) incorrectly completing a classroom routine or procedure	(a) kicking blocks in center (b) sitting on carpet 11 s after direction to go to table (c) sitting at kidney table, but not answering teacher question (verbally or nonverbally) (d) going to a closed center location (e) filling sink with soap rather than placing soap on hands	(a) saying "no thank you" (b) cleaning up when teacher is on last number of countdown (c) sitting backwards in chair and reading book aloud (d) walking to books during choice time (e) turning on sink before getting soap (does not inhibit successful completion of routine)

Note. Engaged and unengaged definitions adapted from previous VAS and SWB research (Bryan & Gast, 2000; Zimmerman, Ledford, & Barton, 2017; Zimmerman, Ledford, & Severini, 2018). Participants may exhibit any of the behaviors a-e to meet criteria for engaged or unengaged. If participant is exhibiting engaged and unengaged behavior simultaneously (looking at teacher while kicking peer), then unengaged behavior will be recorded for the interval. Examples and nonexamples are non-exhaustive. Example and nonexample behaviors specific to a routine or activity may be generated for each target activity.

Table 4. *Problem Behavior Operational Definitions, Examples, and Nonexamples*

Behavior	Operational Definition	Examples	Nonexamples
Out of location	the child's body existing outside the plane of the designated instructional area as defined by the perimeter of the area	(a) body crossing plane of the edge of the large group carpet (b) leaving the child cubbies by exiting the classroom door or walking past the external perimeter of the back of the cubbies into the remaining classroom area (c) leaving the designated table for an instructional center location	(a) laying on floor in targeted instructional area (b) inappropriately manipulating materials in instructional area (c) transitioning between centers (d) going to bathroom after acquiring teacher permission
Inappropriate peer interactions	any instance in which the child (a) throws a material at a peer or (b) physically contacts the peer or peer's materials in an inappropriate manner with his body or a material in his possession	(a) punching peer with closed fist on body (b) taking materials out of peer's hand without permission (c) writing or drawing on a peer's materials or body (d) pushing or shoving peer's body (e) destruction of peer's materials	(a) high five (b) fist bump (c) clapping with a peer or adult during song (d) asking peer for material, peer offering material (verbally or via gesture) then taking material from peer

Note. Definitions were created on an individual basis after completing teacher interviews and observations. Sample definitions adapted from previous research (Zimmerman, Ledford, & Barton, 2017; Zimmerman, Ledford, & Severini, 2018).

Table 5. *Visual Supports Task Analyses Steps*

	Visual Support			
	VAS	SV	Task Analysis Steps	Wait Interval
Xander[a]	x		(1) Locate icon	5 s
			(2) Swipe when finished	5 s
Jason[b]		x	(1) Get material from box	5 s
			(2) Initiate task	10 s
			(3) Return material to box when complete	5 s
Raven[a]	x		(1) Locate icon	5 s
			(2) Swipe when finished	5 s
Marc[c]	x		(1) Take VAS to location	5 s
			(2) Locate icon	5 s
			(3) Initiate task	10 s
			(4) Put icon in bag when finished	5 s
Michael[b]	x		(1) Locate icon	5 s
			(2) Initiate task	10 s
			(3) Put icon in bag when finished	5 s
		x	(1) Locate page	5 s
			(2) Initiate task	10 s
			(3) Turn page when task complete	5 s

Note. VAS=visual activity schedule. SV=structured visuals. a. VAS task analysis repeated steps 1-2 five times each, once for each icon on the VAS. b. The SV task analysis repeated steps 1-3 three times for each work box (Jason) or 4-6 times for each page of the structured visual book (Michael). c. VAS task analysis repeated steps 2-4 six times each, once for each icon on the VAS; step 1 was repeated four times, once for each location change (cubbies, question board, sink, sign in location). The controlling prompt across all steps was a gesture.

Table 6. *Measured Procedural Fidelity Behaviors Across Conditions*

	Pre-Session					During Session				
	BL	BA	SS	SSRC	VS	BL	BA	SS	SSRC	VS
Session conducted in hallway	●	●	●	●	●	-	-	-	-	-
Session conducted in classroom	-	-	-	-	-	●	●	●	●	●
BE read in book	-	-	●	●	-	-	-	-	-	-
Ask questions about book after reading	-	-	-	●	-	-	-	-	-	-
Model use of VS	-	-	-	-	●	-	-	-	-	-
Return child to classroom door	-	●	●	●	●	-	-	-	-	-
CTD procedures implemented	-	-	-	-	-	-	-	-	-	●
Prompting to continue task engagement	-	-	-	-	-	-	-	-	-	-
Contingent reinforcement for task completion	-	-	-	-	-	-	-	-	-	-

Note. BL=baseline. BA=book alone. SS=social story. SSRC=social story plus comprehension questions. VS=visual support (visual activity schedule, work boxes, or visual activity schedule and work boxes). BE=behavioral expectations. CTD=constant time delay. ●= behavior present. -=behavior not present.

Table 7. *Interobserver Agreement and Procedural Fidelity Data Means and Ranges*

Condition	BL	BA	SS	SSRC	VAS	SV	PC
			Xander				
Collected IOA	100%	100%	100%	100%	100%	-	100%
Engagement	94.75 (85-100%)	96% (90-100%)	96.67% (90-100%)	96% (88-100%)	93.33% (88-98%)	-	93.8% (90-98%)
Out of Location	98.83 (88-100%)	99.33% (98-100%)	97.33% (93-100%)	99.67% (99-100%)	100% (88-97%)	-	100% -
Collected PF	50%	33%	33%	33%	56%	-	-
Fidelity	99.17 (95-100%)	100% -	95% -	100% -	97.4% (87-100%)	-	-
			Jason				
Collected IOA	100%	100%	100%	100%	-	100%	-
Engagement	90.27% (83-96%)	90.5% (88-93%)	91% (89-93%)	91.5% (88-96%)	-	92.33% (85-97%)	-
Out of Location	97.36% (89-100%)	94.5% (80-100%)	96% (86-100%)	99.75% (99-100%)	-	100% -	-
Inappropriate Peer	89.8% (60-100%)	85.5% (50-100%)	83.25% (60-100%)	94.25% (88-100%)	-	96.67% (70-100%)	-
Collected PF	42%	33%	33%	33%	-	67%	-
Fidelity	100% -	100% -	100% -	95% -	-	97.75% (92-100%)	-
			Raven				
Collected IOA	100%	100%	100%	100%	100%	-	100%
Engagement	91.18% (82-100%)	91.33% (90-92%)	93.67% (88-100%)	93.67% (88-100%)	90.33% (85-97%)	-	96.4% (93-100%)
Out of Location	98.56% (93-100%)	97.67% (93-100%)	99% (98-100%)	96.58% (94-100%)	94.03% (75-100%)	-	100% -
Collected PF	36%	33%	33%	33%	37.5%	-	-
Fidelity	100% -	100% -	100% -	100% -	100% -	-	-
			Marc				
Collected IOA	100%	100%	100%	100%	100%	-	-
Engagement	97.67% (92-100%)	97% (88-100%)	99% (95-100%)	98% (93-100%)	91.57% (85-95%)	-	-
Out of Location	98.54% (83-100%)	99.54% (98-100%)	99.7% (98-100%)	99.55% (97-100%)	99.29% (95-100%)	-	-
Collected PF	44%	50%	40%	40%	50%	-	-
Fidelity	100% -	100% -	100% -	100% -	100% -	-	-
			Michael				
Collected IOA	100%	100%	100%	100%	100%	100%	-
Engagement	90.58% (84-100%)	90.67% (88-94%)	89.67% (83-93%)	86.67% (84-92%)	88.67% (83-95%)	90.5% (86-94%)	-
Out of Location	99.44% (96-100%)	97.33% (92-100%)	97.78% (93-100%)	99.3% (98-100%)	100% -	99.7% (97-100%)	-
Inappropriate Peer	91.07% (0-100%)	100% -	100% -	96.67% (90-100%)	100% -	100% -	-
Collected PF	33%	33%	33%	33%	33%	40%	-
Fidelity	100% -	100% -	100% -	100% -	100% -	100% -	-

Note. BL=baseline. BA=book alone. SS=social story. SSRC=social story plus comprehension questions. VAS=visual activity schedule. SV=structured visuals. PC=peer comparison. IOA=interobsever agreement. PF=procedural fidelity. Means reported with ranges in parentheses.

Table 8. *Correct Visual Support Task Analysis Completion Data*

	VS Type		Percentage of Unprompted Correct Responses													
			Intervention									Generalization				
	VAS	SV	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**1**	**2**	**3**	**4**	**5**
Xander	x		14	0	100	50	86	71	71	71	86	0	0	0		
Jason		x	12	38	67	75	78	89	100	100	78	72				
Raven	x		0	0	73	64	73	82	55	46		0	100	0	100	22
Marc	x		0	33	70	88	38	62	86	87	84	0	0	0		
Michael	x		0	0	58							-	-	-		
		x	47	0	67	53	86	76	70	12	77	0	0	0		

Note. VS=visual support. VAS=visual activity schedule. SV=structured visuals. Numbers in bold indicate sequential session numbers in the visual support intervention condition only (1=first intervention session).

Table 9. *Social Validity Questionnaire Responses for Target Interventions*

	Overall Rating		Implementation[c]	
Intervention	Effectiveness[a]	Feasibility[b]	Most likely	Least likely
Social stories	Effective (3)	1st quartile (2) no response (1)	2	0
Visual schedules	Effective (3)	2nd quartile (2) no response (1)	0	1
Work boxes	Effective (2) Unsure (1)	3rd quartile (2) 4th quartile (1)	0	0
Alternative seating	Effective (3)	2nd quartile (2) no response (1)	1	0
Choice boards	Effective (2) Unsure (1)	3rd quartile (1) 4th quartile (1) no response (1)	0	1
First/then boards	Effective (3)	1st quartile (1) 3rd quartile (1) no response (1)	0	0
Headphones	Effective (2) Unsure (1)	1st quartile (1) 4th quartile (1) no response (1)	0	2
Point sheets	Effective (2) Unsure (1)	1st quartile (1) 4th quartile (1) no response (1)	2	1
Response cards	Effective (1) Unsure (2)	4th quartile (1) no response (1)	0	3
Token boards	Effective (2) Unsure (1)	3rd quartile (1) 4th quartile (1) no response (1)	3	0
Visual timers	Effective (3)	2nd quartile (2) no response (1)	0	0
Weighted blankets	Effective (2) Unsure (1)	1st quartile (1) 3rd quartile (1) no response (1)	1	1

Note. a. Effectiveness ratings included effective, ineffective, or unsure. b. Teachers ranked the interventions from easiest to hardest to implement. c. Teachers were asked to name the three interventions they were most likely and least likely to implement from the provided list. Numbers in parentheses indicate the number of teachers who gave the response. Three teachers of target participants completed the survey questions. Definitions of each intervention can be found in Appendix H.

Procedural Fidelity Data Collection-Preference Assessments

Date: _____ Intervention: SS VAS Data Collector: _____ Implementer: _____ Participant: _____

Correct intervention: **YES** **NO** Correct materials presented: **YES** **NO**

Trial	Place items in correct array	Deliver task direction	Wait 10 s	Remove items	Record choice	Wait 5 s	Retrieve selected item	Remove selected item from array	Reposition items
1a									
1b									
1c									
2a									
2b									
2c									
3a									
3b									
3c									
4a									
4b									
4c									
5a									
5b									
5c									
6a									
6b									
6c									

Correct steps: _____ Incorrect steps: _____ PF Calculation: C/(C+I)*100 = _____

Figure 1. Preference Assessment Procedural Fidelity Data Collection Form.

Social Stories Studies Procedural Fidelity Data Sheet

Date: _____ Condition: BL BA SS SSRC Data Collector: _____ Implementer: _____ Participant: _____

Participant taken to hallway: **YES NO** Pre-session ≤ 5 min: **YES NO**
Classroom teacher present at pre-session: **YES NO** Session ≤ 10 min: **YES NO**

Behavior	Tally occurrence	Notes
Book Alone Condition		
Told child they were going to read a story		
Read story (leveled reader)		
Asked child questions during story		
Asked child questions after story		
Walked child back to class		
Asked child "where do you want to play"		
Took child to desired location		
Delivered reinforcement (edible or tangible)		
Social Story Condition		
Told child they were going to read a social story		
Read social story		
Asked child questions during social story		
Asked child questions after social story		
Walked child back to class		
Asked child "where do you want to play"		
Took child to desired location		
Delivered reinforcement (edible or tangible)		
During Session		
Implementer talks to participant		
Implementer prompts child with physical, gestural, model, or verbal prompt		
Implementer provides verbal praise to child		
Implementer tells teacher the condition		
Implementer manipulates environmental materials		
Delivered reinforcement (edible or tangible)		

Numerator _____ Denominator: _____ PF calculation: C/(C+1)*100 = _____

Figure 2. Procedural Fidelity Data Collection Form: Baseline and Social Stories Conditions.

Procedural Fidelity Data Collection-Visual Supports Study (Child VAS Completion Reliability Data Form)

Date: _____ Condition: BL INT GEN Participant: _____ Implementer: _____ Data Collector: _____

Materials set up prior to start of session: **YES NO**

Session length ≤ 10 min: **YES NO**

Which visual support was scheduled: **VAS WB VAS+WB**

Was verbal prompting used: **YES NO**

Was gestural prompting used: **YES NO**

Noncontingent social praise every 3 min on average: **YES NO**

VAS Activity Icon Position	Walk to VAS OR locate icon (Step 1)	Wait interval 10s	Physical prompt	Initiate task (Step 2)	Wait interval (10s)	Physical prompt	No response away from materials/task <30s	≥30 s away from materials/location prompt to next icon	Wait interval (5s)	Physical prompt
1										
2										
3										
4										
5										

PF Calculation

Correct steps: _____

Incorrect steps: _____

C/(C+1)*100 = _____

Notes:

Work Bin	Get material from bin	Wait interval (5 s)	Physical or gestural prompt	Initiate task	Wait interval (10 s)	Physical or gestural prompt	Return material to box	Wait interval (5 s)	Physical or gestural prompt
Bin 1									
Bin 2									
Bin 3									

Figure 3. Procedural Fidelity and Child Completion Reliability Data Collection Form: Baseline and Visual Supports Conditions

Figure 4. Book format sample social story page for reading centers (Jason).

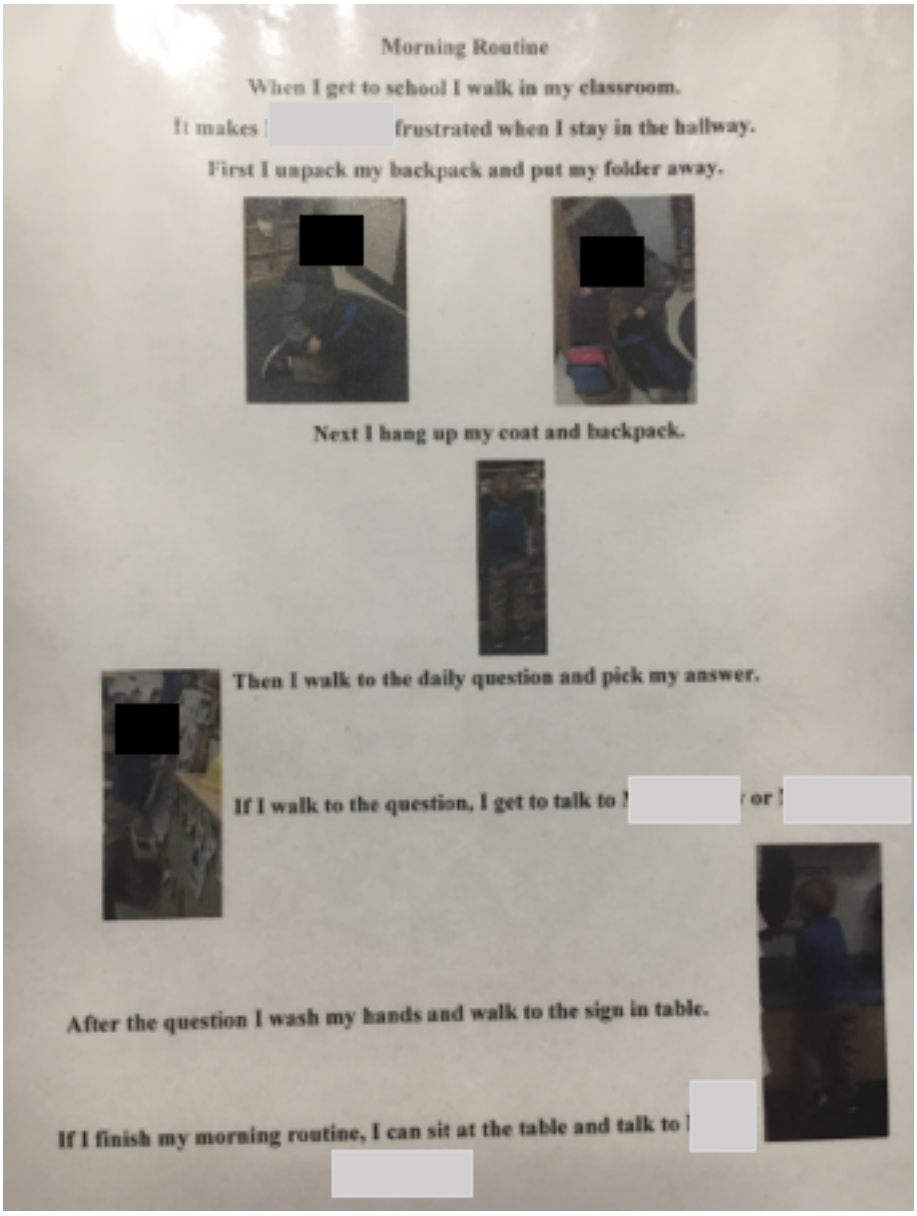

Figure 5. Traditional format sample social story for morning routine (Michael).

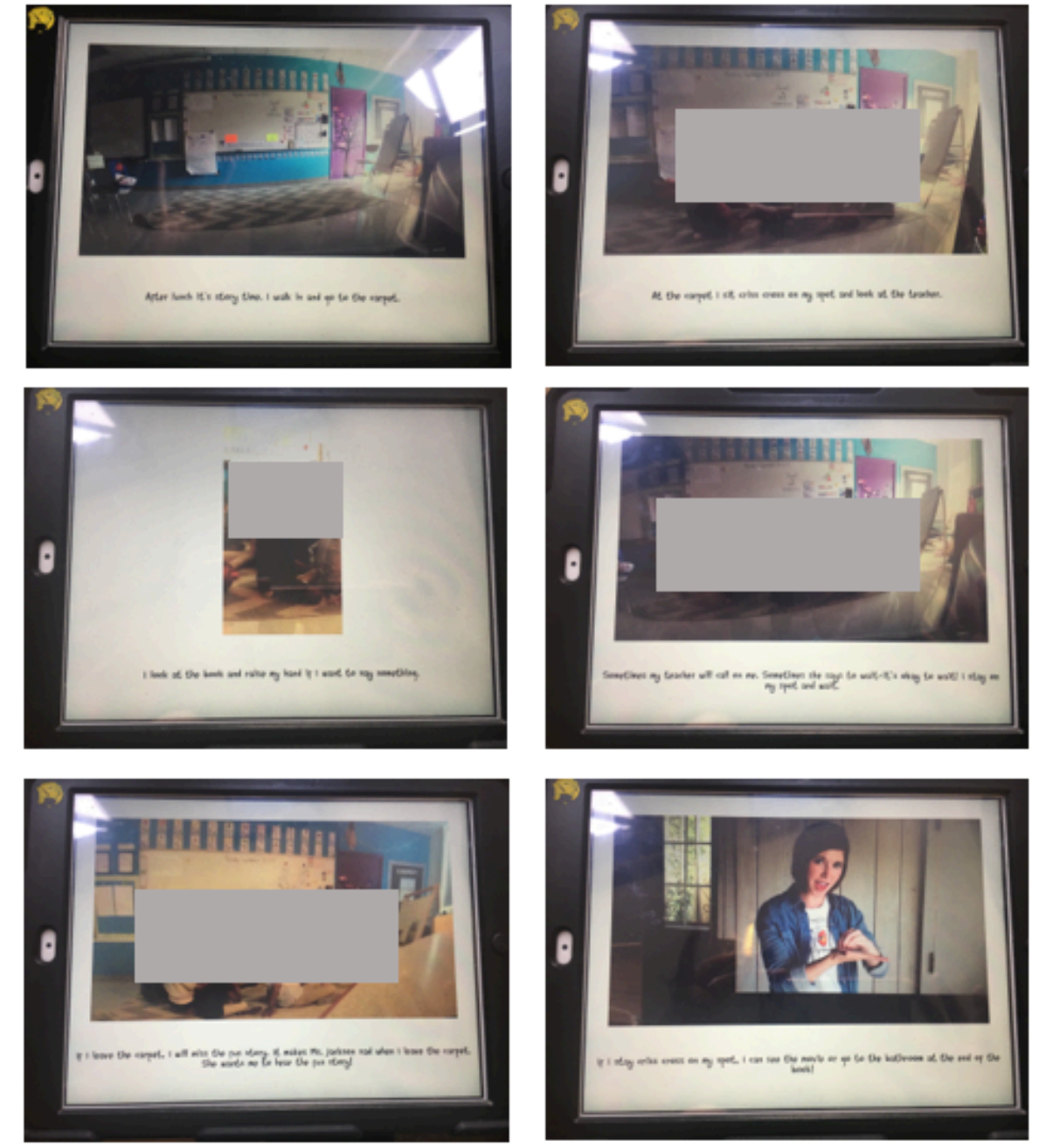

Figure 6. Digital format social story for whole group reading instruction (Xander): Social Stories Creator and Library© Application.

Figure 7. Book format visual activity schedule for whole group reading instruction (Xander).

Figure 8. Traditional format visual activity schedules: Marc morning routine (top panel) and Michael morning meeting (bottom panel).

Figure 9. Digital format visual activity schedule for whole group math instruction (Raven): Choiceworks Social Behavioral and Scheduling App©.

Figure 10. Structured visual supports: work boxes top panel (Jason) and structured visuals book bottom panel (Michael).

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Time	Group 0	Comments
00:00:00.00	e	
00:00:10.00	u	
00:00:20.00	e	
00:00:30.00	e	

Time	Group 0	Comments
00:00:00.00	s	
00:00:07.38	o	
00:02:50.22	s	
00:03:01.23	o	
00:03:12.02	s	
00:03:19.97	o	

Time	Group 0
00:00:00.00	
00:08:04.61	a

Figure 11. ProCoderDV sample code files for engagement (top panel), out of location (middle panel), and inappropriate peer interactions (bottom panel).

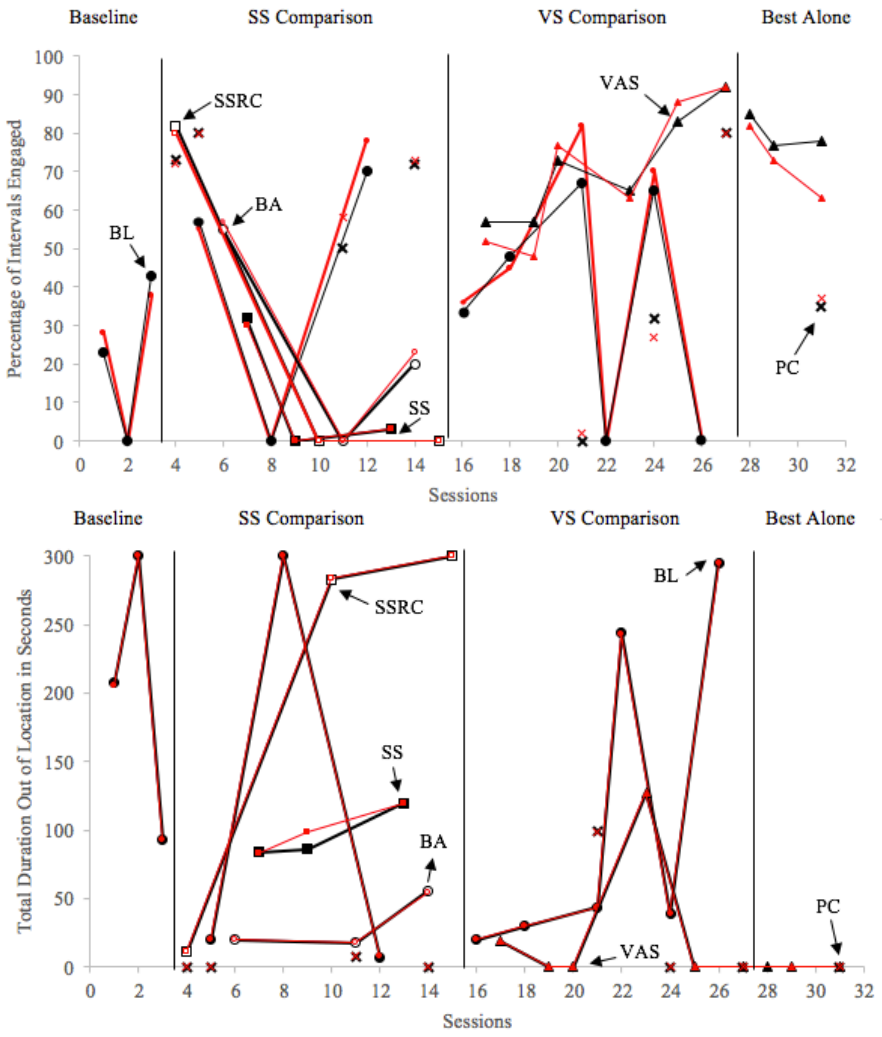

Figure 12. Xander engagement (top panel) and out of location data (bottom panel). Black data paths are primary data; red data paths are second observer reliability data. SS=social story. VS=visual support. BL=baseline. BA=book alone. SSRC=social story plus comprehension questions. PC=peer comparison. VAS=visual activity schedule.

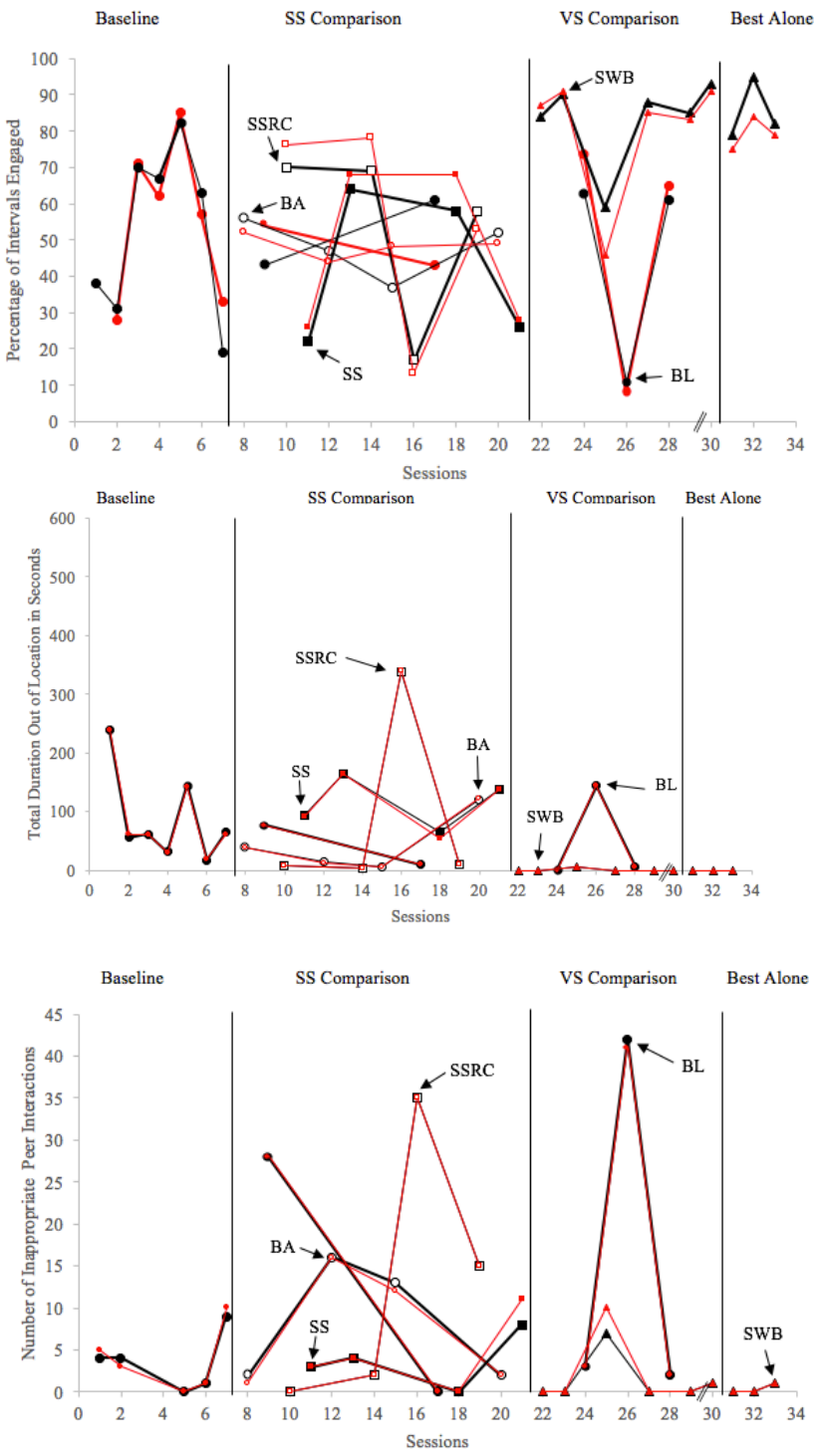

Figure 13. Jason engagement (top panel), out of location (middle panel), and inappropriate peer interactions (bottom panel) data. Black data paths are primary data; red data paths are second observer reliability data. SS=social story. VS=visual support. BL=baseline. BA=book alone. SSRC=social story plus comprehension questions. SWB=structured work boxes.

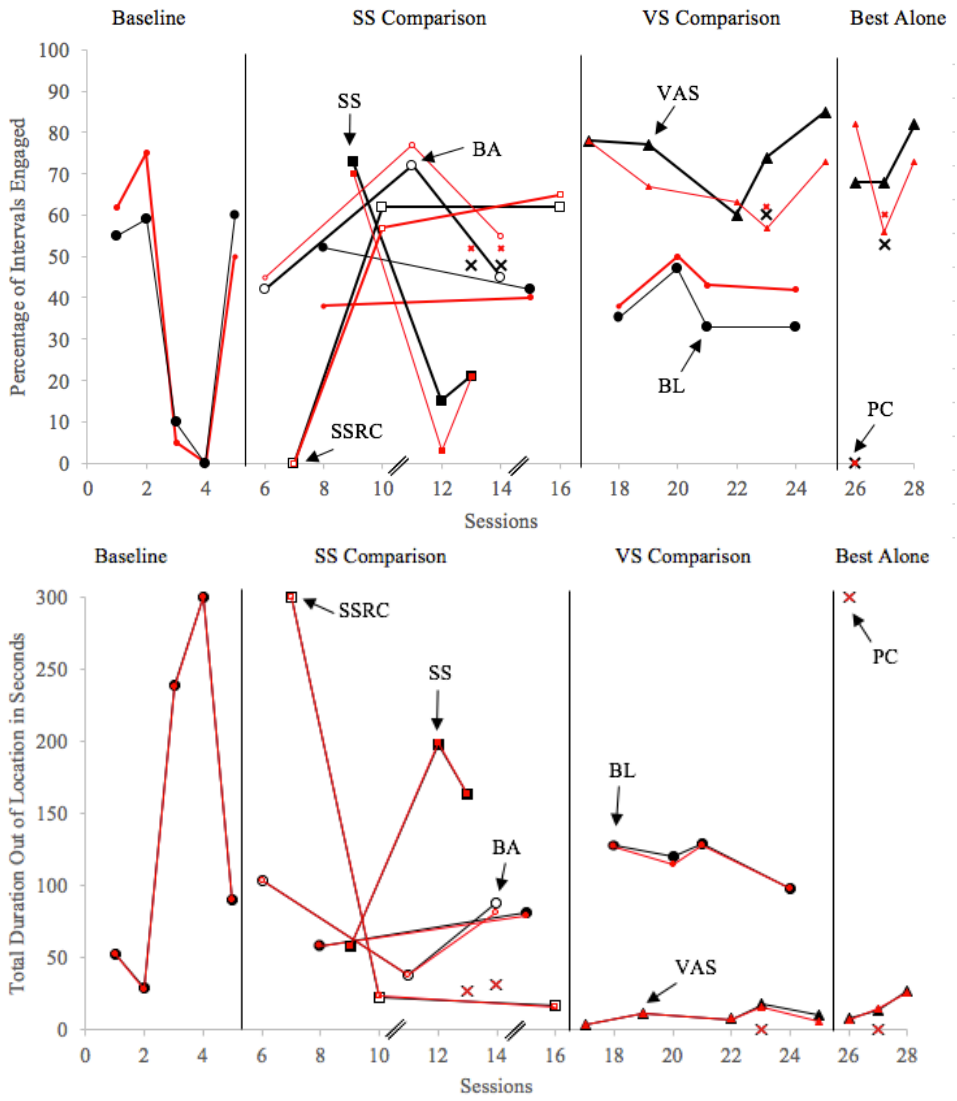

Figure 14. Raven engagement (top panel) and out of location (bottom panel) data. Black data paths are primary data; red data paths are second observer reliability data. SS=social story. VS=visual support. BL=baseline. BA=book alone. SSRC=social story plus comprehension questions. PC=peer comparison. VAS=visual activity schedule.

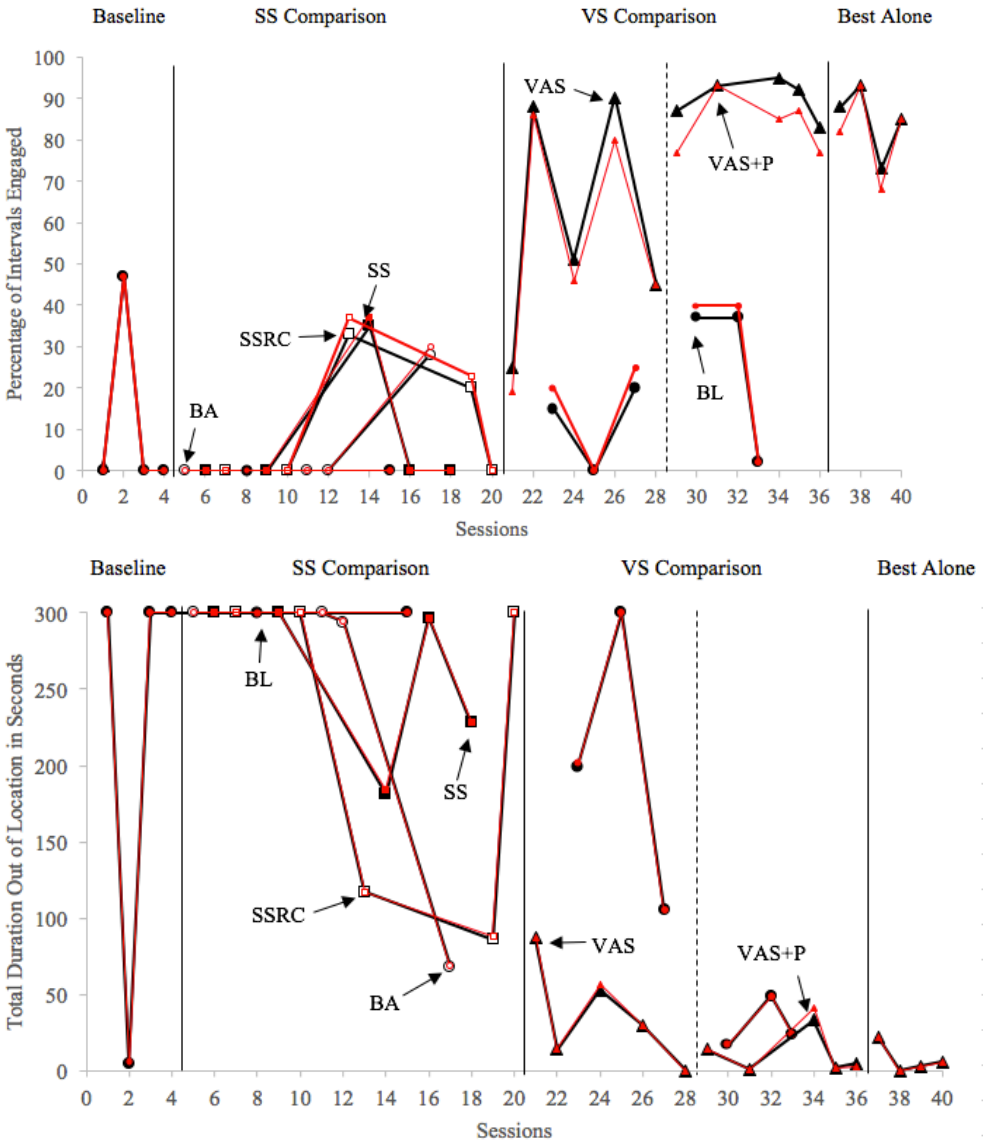

Figure 15. Marc engagement (top panel) and out of location (bottom panel) data. Black data paths are primary data; red data paths are second observer reliability data. SS=social story. VS=visual support. BL=baseline. BA=book alone. SSRC=social story plus comprehension questions. VAS=visual activity schedule. VAS+P=visual support plus preferred images.

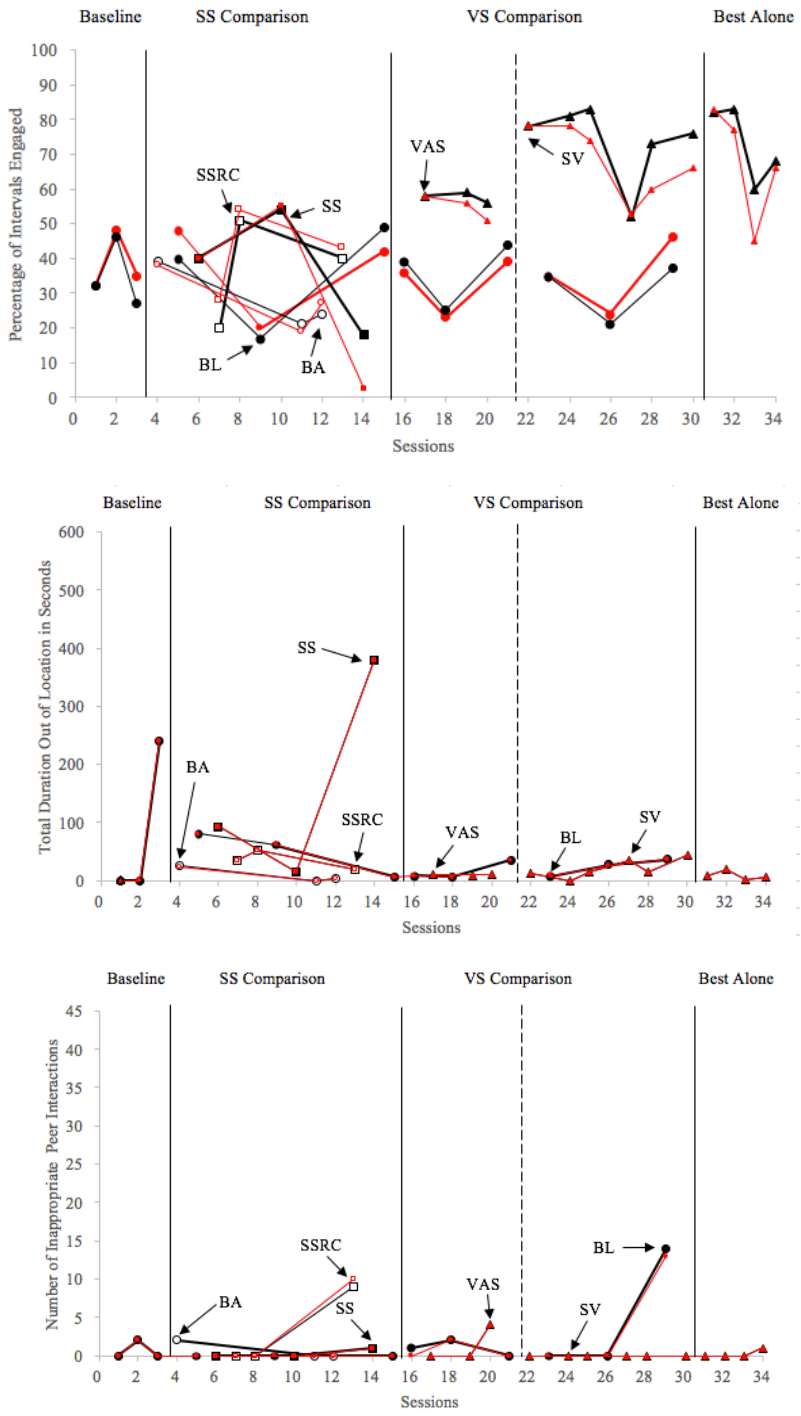

Figure 16. Michael engagement (top panel), out of location (middle panel), and inappropriate peer interactions (bottom panel) data. Black data paths are primary data; red data paths are second observer reliability data. SS=social story. VS=visual support. BL=baseline. BA=book alone. SSRC=social story plus comprehension questions. VAS=visual activity schedule. SV=structured visual supports.

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Appendix A

Classroom Observation Form

Participant: _____	**Date: _____**
Teacher: _____	**Location: _____**
Start time: _____	**End time:_____**
Activities:	
Performance Deficit	**Skill Deficit**

Antecedent	Behavior	Consequence

Appendix B

Teacher Interview Summary

Participant: _____ Date: _____ **Researcher: _____ Teacher: _____** **Location: _____ Start Time: _____ End Time: _____**
How many times has the student been absent in the past three months? Note if there are special considerations regarding attendance (absent every other Monday during centers).
Does the participant demonstrate object-picture correspondence? If you show him a picture/photograph/drawing of the bathroom, will he identify the location?
What activities, routines, or transitions does the child have trouble completing? Ask about each center you see in the classroom. If needed, prompt the teacher to give specific examples (i.e. cutting paper at art or washing a baby at dramatic play).
Tell me about the participant's problem behavior. What does it look like? When does it occur? How often does it occur?
When is a good time of day to observe the student when s/he exhibits problem behavior? **Do you think he/she exhibits problem behavior because they don't have the skills to do the task (skill deficit) or because they aren't doing it, even though they know how to do each part (performance deficit)?**
Participant demographic information: **Age:** **Birthday:** **Gender:** **Race/Ethnicity:** **Disability status:**
Do you have access to information about whether or not the child receives support (school or community) based on family need? If so, do you know if the child lives in a household below the poverty line (show poverty line information figure on next page)?
Available student test scores: (test name; standardized score (if available), % correct/total for CBMs)

Let's select a visual support intervention that may best address the child's needs (follow flow chart in Appendix E and ask questions for each portion of diagram-left to right). Does this seem like a reasonable intervention to include in your classroom?
Is there any additional information I need to know?

U.S. Department of Health and Human Services Poverty Guidelines, 2017

	Annual Income		
Persons in Family/Household	**48 Contiguous States and District of Columbia**	**Alaska**	**Hawaii**
1	$12,060	$15,060	$13,860
2	16,240	20,290	18,670
3	20,420	25,520	23,480
4	24,600	30,750	28,290
5	28,780	35,980	33,100
6	32,960	41,210	37,910
7	37,140	46,440	42,720
8	41,320	51,670	47,530
>8 persons	For families/households with more than 8 persons, add $4,180 for each additional person.	For families/households with more than 8 persons, add $5,230 for each additional person.	For families/households with more than 8 persons, add $4,810 for each additional person.

Source: *Federal Register*, Vol. 82, No. 19, January 31, 2017, pp. 8831-8832. Available at https://www.gpo.gov/fdsys/pkg/FR-2017-01-31/pdf/2017-02076.pdf.

Notes: Section 673(2) of the Omnibus Budget Reconciliation Act (OBRA) of 1981 (42 U.S.C. 9902(2)) requires the Secretary of the Department of Health and Human Services to update the poverty guidelines at least annually, adjusting them on the basis of the Consumer Price Index for All Urban Consumers (CPI-U). As required by law, this update is accomplished by increasing the latest published Census Bureau poverty thresholds by the relevant percentage change in the Consumer Price Index for All Urban Consumers (CPI-U). The guidelines in this 2017 notice reflect the 1.3 percent price increase between calendar years 2015 and 2016. After this inflation adjustment, the guidelines are rounded and adjusted to standardize the differences between family sizes. Separate guidelines for Alaska and Hawaii reflect administrative practice adopted in the late 1960s. The poverty guidelines are designated by the year in which they are issued and are updated to account for the last calendar year's increase in prices as measured by the Consumer Price Index.

Appendix C

Peer Comparison Letter

Dear Teacher,

Please rank the children in your classroom based on their performance from highest to lowest given the statement below:

This child consistently engages and participates in classroom activities with little to no teacher prompting during _____. He/she follows teacher directions regularly.

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____
11. _____
12. _____
13. _____
14. _____
15. _____
16. _____
17. _____
18. _____
19. _____
20. _____
21. _____
22. _____

You can use each child's first name and last initial if multiple children have the same first name (Katie A., Katie G.). This list will be destroyed during the first day of baseline data collection if a child in your classroom meets study inclusion criteria.

Appendix D

Preference Assessment Data Sheet

Date: _____ Participant: _____Implementer: _____ Intervention: SS VAS

Format 1: _____ Format 2: _____ Format 3: _____

Trial 1

Presentation #	Item selected	Placement of selected item
1		1 2 3
2		X X
3		X

Trial 2

Presentation #	Item selected	Placement of selected item
1		3 1 2
2		X X
3		X

Trial 3

Presentation #	Item selected	Placement of selected item
1		2 3 1
2		X X
3		X

Trial 4

Presentation #	Item selected	Placement of selected item
1		1 2 3
2		X X
3		X

Trial 5

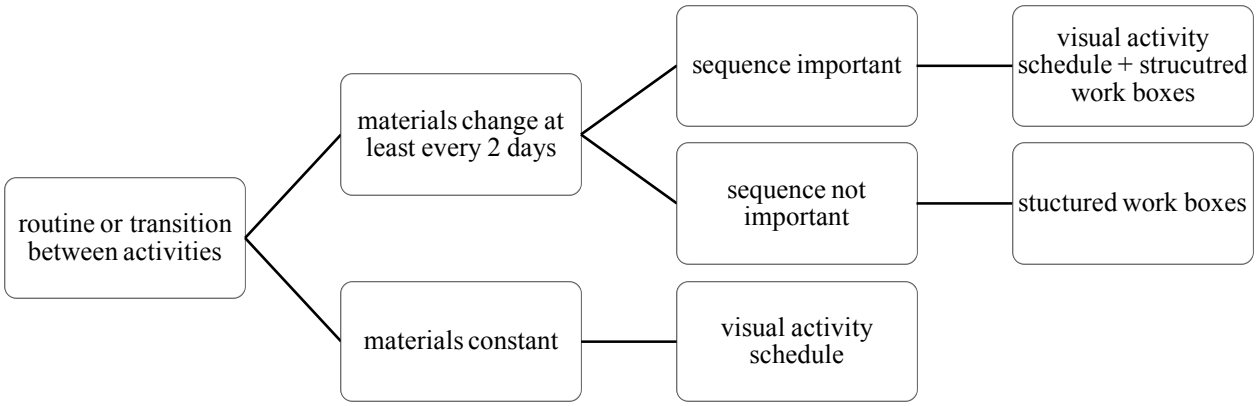
Presentation #	Item selected	Placement of selected item
1		2 3 1
2		X X
3		X

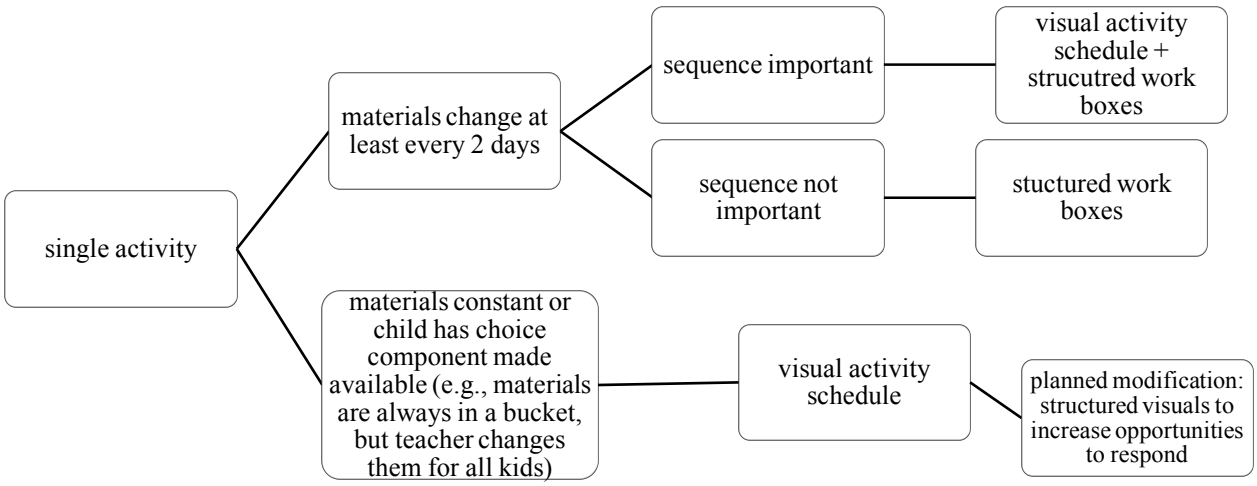
Trial 6

Presentation #	Item selected	Placement of selected item
1		3 2 1
2		X X
3		X

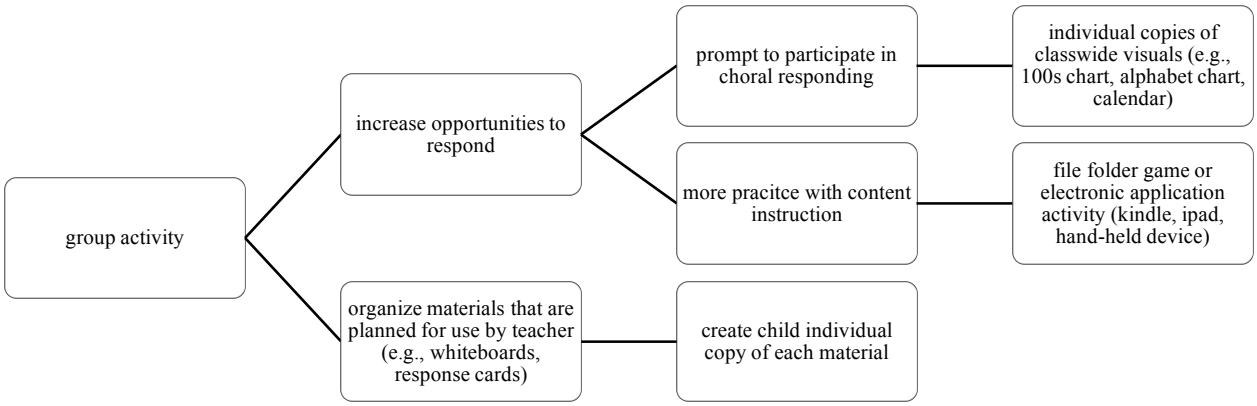
Preferred Format

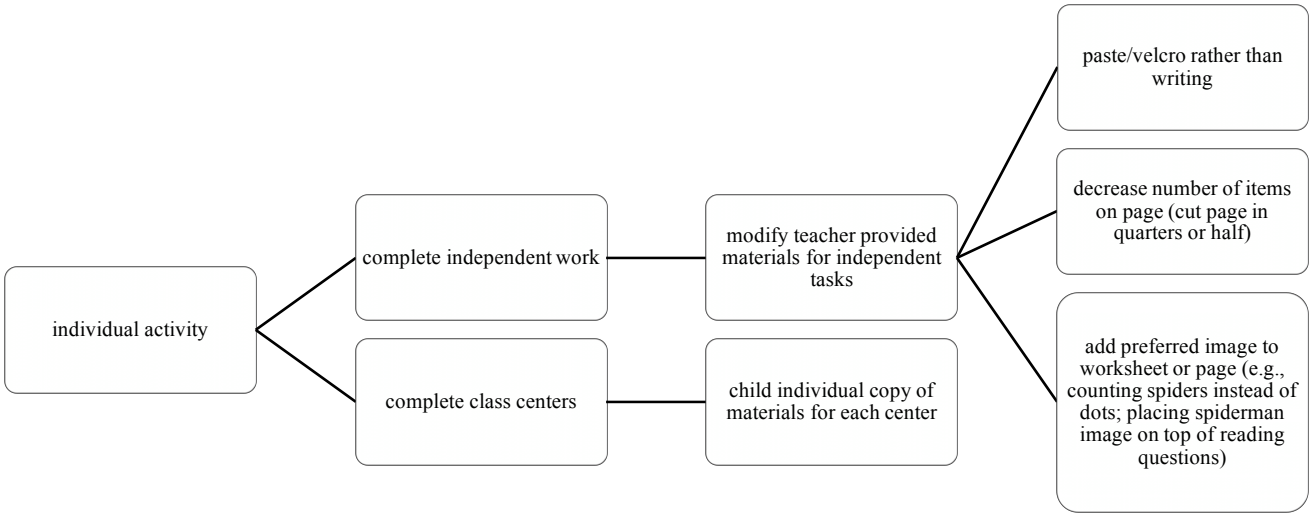
Appendix E
Visual Supports Decision Rules





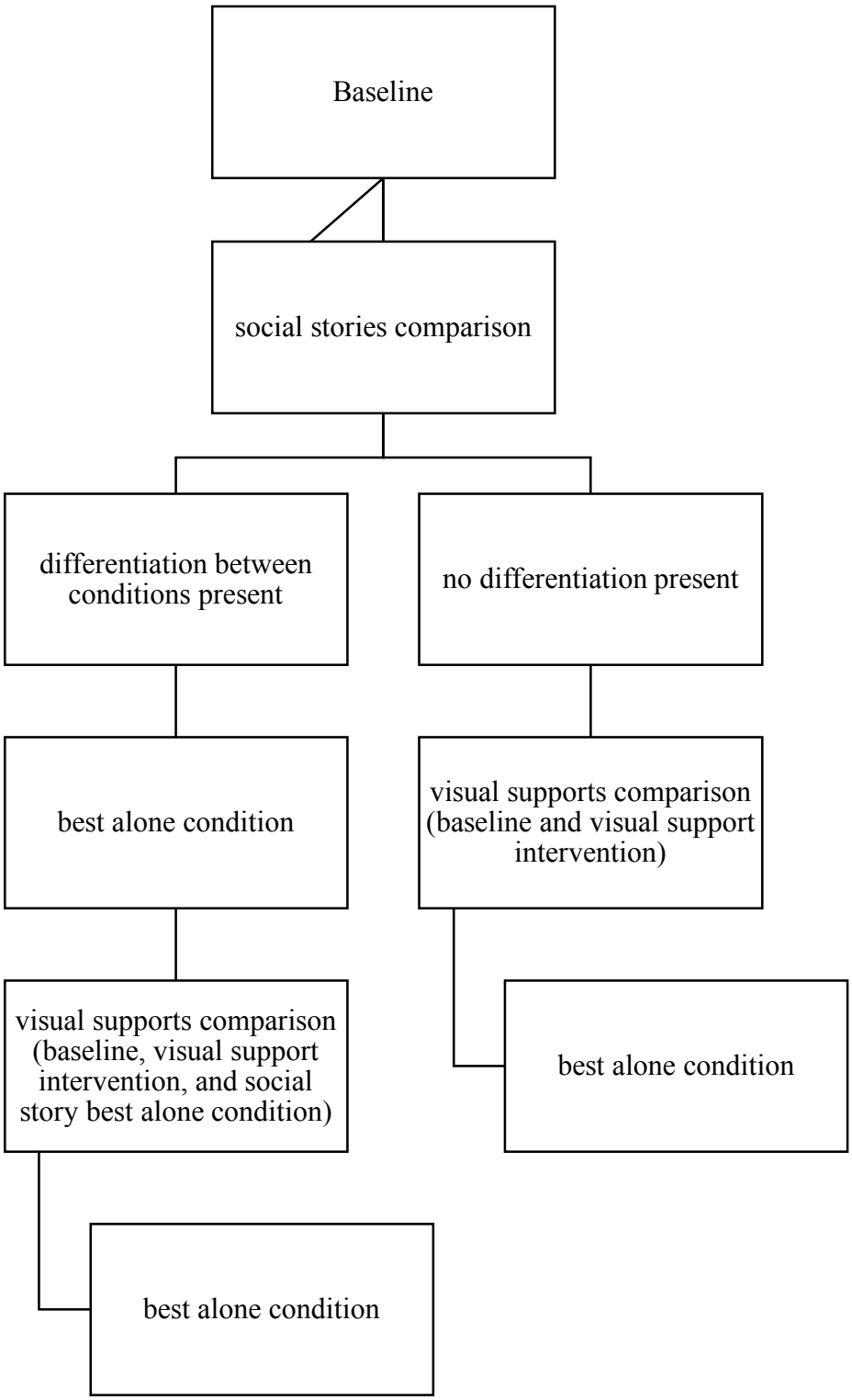
Appendix F
Structured Visuals Materials Decision Rules





Appendix G

Study conditions decision tree



Appendix H
Stakeholder Survey

Please choose the options that best describe you:

Position/Role: one-on-one certified sped teacher certified general ed teacher paraprofessional

Age in Classroom: Preschool Kindergarten First Second Mixed age: _____

Type of classroom in which you work: Inclusive General education Special education (resource/self-contained)

Years of experience in current position: _____

Years of experience working in school settings (preschools or elementary schools): _____

Please read each description, then select the word that best describes how you would rate the intervention for improving child engagement in the classroom.

Weighted blankets. Weighted blankets are small cloth blankets filled with rice, sand, or beans that can be placed on a child's lap or over a child's body during an activity to improve their behavior.

_____ Effective _____ Ineffective _____ Unsure

Social stories. Social stories are brief stories read to children that provide information about a situation or activity (e.g., fire drill) that is about to happen. The story tells children the expected behavior, when to do it, consequences for doing it correctly, and language to use during the activity.

_____ Effective _____ Ineffective _____ Unsure

Token boards. Token boards are a way to reward children for doing what you ask. A child is given a goal (e.g., 5 tokens) and an adult delivers a token to the child every time he does what the adult asks. When the child earns all the tokens, he can turn them in for a reward (e.g., small toy, extra time outside, snack).

_____ Effective _____ Ineffective _____ Unsure

Visual schedules. Visual schedules are small books or strips with 3-5 pictures that tell children what is coming up next. Each picture represents a different location, activity, or step within an activity to be completed in a particular order. They can be used during one activity or across the entire school day.

_____ Effective _____ Ineffective _____ Unsure

Headphones. Headphones are devices placed over a child's ears during an activity that may be loud or distracting. They are used to limit distractions for a child.

_____ Effective _____ Ineffective _____ Unsure

Alternative seating. Alternative seating options are bouncy balls, squishy cushions, or rocking chairs that children can sit on rather than typical chairs.

_____ Effective _____ Ineffective _____ Unsure

First/then boards. First/then boards are t-charts with the words "first" and "then" above each column. A word or picture of an activity is placed in the "first" and "then" columns. Children must complete the activities in the exact order. Often the "then" activity or item is something that is preferred by the child.

_____ Effective _____ Ineffective _____ Unsure

Visual timers. Visual timers give children a visual representation of how much time is left in an activity (e.g., sand falling; red section of clock getting smaller). They are set at the beginning of an activity so the child knows how long they have in the current activity or how much time until the next activity.

_____ Effective _____ Ineffective _____ Unsure

Work boxes. Work boxes are physical boxes, buckets, or baskets placed in a child's work area that each hold one activity. The child completes the activities in the buckets in order then is done. The work can be work with a teacher or independent work.

_____ Effective _____ Ineffective _____ Unsure

Choice boards. Choice boards include up to 10 pictures or drawings of the items available for a child to choose during an activity (e.g., foods available for lunch). The child picks the items or activities she wants to complete and hands them to the teacher or takes them off the board.

_____ Effective _____ Ineffective _____ Unsure

Response cards. Response cards are small cards with colors (e.g., red/green) or words (e.g., yes/no) that are given to each child during whole group or small group instruction. The teacher poses a question and children respond by holding up a card

_____ Effective _____ Ineffective _____ Unsure

Point sheets. Point sheets are a chart with a row for each time of day or activity in a child's schedule. At the end of the activity, the child can earn points for good behavior. Points are marked by the adult by coloring a face (smiley face for good behavior; sad face for bad behavior) or by circling a number (0 points for bad behavior, 1 point for okay behavior, 2 points for good behavior). At the end of the day the child can turn in the points for a reward.

_____ Effective _____ Ineffective _____ Unsure

The following interventions are often used in classrooms to improve children's behavior and participation. Please place the following interventions on the scale from easiest to hardest to implement in your classroom. Feel free to use the descriptions above as explanations of each intervention.

weighted blankets	social stories	token boards	visual schedules	headphones
alternative seating	first/then boards	visual timers	work boxes	choice boards
response cards	point sheets			

Easiest to implement: 1.

2.

3.

4.

5.

6.

7.

8.

9.

10.

11.

Hardest to implement 12.

Please answer the following questions using the interventions in the box below.

weighted blankets	social stories	token boards	visual schedules	headphones
alternative seating	first/then boards	visual timers	work boxes	choice boards
response cards	point sheets			

List the 3 interventions you would be **most likely** to use in your classroom.

1. _____
2. _____
3. _____

List the 3 interventions you would be **least likely** to use in your classroom.

1. _____
2. _____
3. _____