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## THE USE OF TECHNOLOGY TO IMPLEMENT PEER MEDIATED INTERVENTION: STUDENTS WITH AUTISM AS TUTORS AND TUTEES

Lindsey R. Graessle

University of Kentucky, [lindsey.graessle@gmail.com](mailto:lindsey.graessle@gmail.com)

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Lindsey R. Graessle, Student

Dr. Melinda Ault, Major Professor

Dr. Melinda Ault, Director of Graduate Studies

THE USE OF TECHNOLOGY TO IMPLEMENT PEER MEDIATED  
INTERVENTION: STUDENTS WITH AUTISM AS TUTORS AND TUTEES

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THESIS

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A thesis submitted in partial fulfillment of the requirements  
for the degree of Master of Science in Education in the  
College of Education  
at the University of Kentucky

By

Lindsey R. Graessle

Lexington, Kentucky

Director: Dr. Melinda Ault, Professor of Special Education

Lexington, Kentucky

2018

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## ABSTRACT OF THESIS

### THE USE OF TECHNOLOGY TO IMPLEMENT PEER MEDIATED INTERVENTION: STUDENTS WITH AUTISM AS TUTORS AND TUTEES

Peer mediated interventions have been effective in teaching academic and social skills to students with disabilities. The present study assesses the effectiveness of students with autism spectrum disorder serving as the tutor and tutee. Four peer mediators and four students with autism spectrum disorder used technology and the simultaneous prompting procedure to teach acquisition of social studies vocabulary. Results indicate that both students with and without autism spectrum disorder effectively delivered instruction using technology and all students learned a portion of the vocabulary taught by a same-aged peer.

**KEYWORDS:** Autism spectrum disorder, peer-mediated intervention, simultaneous prompting, technology, social initiations

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Lindsey R. Graessle

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April 17, 2018

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By

Lindsey R. Graessle

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Dr. Melinda Ault

Director of Thesis

---

Dr. Melinda Ault

Director of Graduate Studies

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April 17, 2018

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## **Section 1: Introduction**

Previous research supports and recommends that students with moderate and severe disabilities (MSD) including autism spectrum disorder (ASD) be instructed with interventions that use a systematic approach (Collins, 2012). Several response prompting strategies have been identified as effective in teaching new skills to students with MSD including single prompt strategies of time delay including simultaneous prompting and multiple prompt strategies including system of least prompts (Collins, 2012).

One response prompting strategy, simultaneous prompting (SP), is a research-based strategy that has been used to teach a variety of skills across age levels to students with MSD including discrete and chained tasks (Waugh, Alberto, & Fredrick, 2011). The SP procedure is a relatively simple procedure in which instructors conduct a test or probe trials to determine when acquisition of a behavior has occurred, followed by instructional or training trials to teach the target behavior (Collins, 2012). Training trials consist of the instructor providing the discriminative stimulus immediately followed by the controlling prompt simultaneously (e.g., verbal model of a target behavior). The sequence continues until the learner meets criterion during probe trials. Probe sessions are recommended each day of instruction to assess transfer of stimulus control (target behavior in response to the discriminative stimulus alone; Collins, 2012). The SP procedure is considered less complex to implement than other response prompting procedures as it does not require a change in instructor's behavior as the procedures remain the same throughout all training sessions (Schuster, Griffen, & Wolery, 1992).

An initial review of literature conducted by Morse and Schuster (2004) identified 18 studies published in peer reviewed journals that examined the effects of SP. Since the

initial review, Waugh, Alberto, and Fredrick (2011) identified 17 additional studies following the same criteria for a combined total of 35 articles spanning 18 years (1992-2010). The SP procedure has been used to teach students with disabilities discrete and chained tasks. Skills taught using the SP procedure include literacy skills, math skills, communication skills, daily living skills, leisure skills, and vocational skills (Waugh, Alberto, & Fredrick, 2011). Multiple studies (16 out of 35 articles) have used SP to teach literacy skills to participants with disabilities, including successfully teaching sight word identification to 49 out of 50 participants. Relatedly, SP was effective in the six studies that targeted for teaching math skills to a total of 11 participants. Communication skills were targeted in seven studies and was effective for 21 out of 23 participants. Daily living skills such as setting the table, preparing a sandwich, and opening a combination lock were also targeted in studies. The results indicated that 20 out of 23 participants were successfully taught using the SP procedure (Waugh et al., 2011).

Peers implementing instruction is known as peer-mediated instruction and involve interventions in which peers are taught to systematically provide instruction to students with disabilities (Sperry, Neitzel, & Engelhardt-Wells, 2010). Peer-mediated instruction has been shown to have positive effects on academic and social development for students with MSD (Sperry et al., 2010). Most studies examining the SP procedure have used the teacher as the interventionist, but the review of literature by Waugh et al. (2011) indicated it was successfully implemented by paraprofessionals, parents, caregivers, sibling tutors, and students without disabilities (SWOD). Researchers have begun to test the effects of peers implementing instruction to students with disabilities (SWD). Britton, Collins, Ault, and Bausch (2017) discussed the benefit of support personnel and

volunteers learning to implement evidence-based instructional strategies for SWD. In their study, a paraprofessional and a peer were taught to implement the SP procedure before they provided instruction to a SWD targeting multiple behaviors including identifying words, making Kool-aid, and alphabetizing last names by their first letters (Britton et al., 2017). The results indicated that procedures were implemented with fidelity and the SWD learned the target skill taught using the SP procedure.

When using peer-mediated intervention, it is imperative that peers are trained to a high degree of fidelity in implementing the procedures (Collins, 2012). Because the SP procedure includes providing the controlling prompt immediately following the discriminative stimulus on every trial during instruction, the procedure is relatively easy to implement, which allows peers to deliver procedures with fidelity and few errors (Smith et al., 2011). Tekin-Iftar (2003) evaluated if peers could reliably implement the SP procedure to teach four students with developmental disabilities to identify community signs. Peers were taught the SP procedure through verbal description, role modeling, guided practice, and performance feedback. Results indicated that peers delivered the SP procedure with fidelity and the students with developmental disabilities learned through peer instruction.

Peer mediated intervention allows students with ASD to have experience working with their peers and provides opportunities for students with and without disabilities have social opportunities (Sperry et al., 2010). Studies have used peer mediated interventions to increase social interactions and improve relationships between students with ASD and their peers (Sperry et al., 2010). Social challenges are a defining feature of ASD, including the understanding of the back and forth nature of social interactions

(Sperry et al., 2010). Studies indicate that students with ASD are often rejected by their same-age peers without disabilities due to delayed social competence such as students who withdrew from peer interactions, lacked social skills, and communication deficits (Odom, Zaercher, Li, Marquart & Sandall, 2001). A study by Odom, Zaercher, Li, Marquart and Sandall (2001) used a multimethod approach to study peer rejection, and the results indicated that out of 80 children with disabilities, one-third of these children were socially rejected by their same-aged peers without disabilities.

Peer-mediated instruction can address these concerns by teaching typically developing peers methods for successfully engaging students with ASD (Sperry et al., 2010). Training peers using direct instruction on how to interact with students with ASD is important and has been found to create a greater tolerance for differences of people with disabilities (Sperry et al., 2010). A study by Bass and Mulick (2007) highlighted the use of peer-mediated intervention as the most supported social intervention for students with ASD.

Professionals should identify and use interventions that promote improvements in social behaviors for students with MSD (Carter et al., 2015). One method to increase social interactions between students with and without ASD is to embed opportunities during instruction. This method allows the teacher to plan and create opportunities for interaction between students (Lane, Gast, Ledford & Shepley, 2015). Lane and colleagues used student's interests as a support for students to self-initiate appropriate interactions with their peers in the form of pictures. The researchers in this study taught students in preschool to read sight words and presented photographs of their peer's

preferred items or activities in the consequent event as non-target information. At the conclusion of the study, all children learned some of his or her peer's interests.

An additional strategy that has been used effectively with students with ASD is incorporating technology-based instruction. Technology has emerged as a major component in special education for its ability to increase learning, facilitate communication, and independence. (Collins, 2012). The use of technology has been used to educate students with ASD for over 35 years and technology devices are becoming standard instructional tools in the classroom (Knight, McKissick, & Saunders, 2013). Collins (2012) stated that instructors can easily program many types of technology to be used within the context of systematic instruction.

The purpose of this study was to extend the literature on peer-based instruction, specifically training children with and without disabilities to implement 0-s prompt delay trials as part of SP instruction. Collins (2012) stated that some researchers believe that using peers for instruction can create an unbalanced tutor-tutee mentality where one group of students feels superior to another. Therefore, research is needed to demonstrate how students with ASD can participate as both tutor and tutees to create a natural learning experience between both students. This study taught the participants to use technology which allowed for all students to serve as tutors. In addition, this study evaluated the effectiveness of embedding preferred characters to promote social interactions between students during instructional trials. This approach can allow students with and without disabilities the opportunity to work alongside each other in the classroom with both parties serving in valued roles and increase positive relationships.

## Section 2: Research Question

The purpose of this investigation was to teach elementary aged students with and without ASD to deliver instruction to one another using simultaneous prompting through technology while also measuring increased social interactions between both sets of students. The research questions included:

1. What are the effects of a peer without disabilities using technology and SP to teach acquisition of social studies vocabulary to elementary-aged students with ASD in a special education setting?
2. What are the effects of students with ASD using technology to provide instructional trials to teach the acquisition of social studies vocabulary to elementary peers without disabilities in a special education setting?
3. To what extent will students with ASD learn the target vocabulary being taught to the student without disabilities?
4. Can an elementary peer without disabilities use technology to implement the SP procedure with fidelity?
5. Can an elementary student with ASD use technology to deliver instructional trials with fidelity?
6. When preferred characters are embedded in the instructional trials for children with and without ASD, will social initiations and responses increase? If increases in interactions were not observed, will a system of least prompts procedure lead to increase in social interactions between children with and without disabilities?



### Section 3: Method

#### Participants

**Inclusion criteria.** Eight students were chosen to participate in the study: four students without disabilities (SWOD) and four students with disabilities (SWD) All students attended the same elementary school. Two SWOD and two SWD were in the fifth grade. Two SWOD and two SWD were in the first grade. One SWD was paired with one SWOD from the same grade level to form a dyad that was maintained for the remainder of the study. Information on each dyad is shown in Table 1.

Each peer mediator was paired with one SWD that participated with their general education classroom at least once per instructional day. SWOD were nominated by their classroom teachers as either a positive role model or enjoyed a role helping others. All SWD received special education services under the eligibility category of ASD through eligibility determination conducted within their school district. The classroom setting for all students was in the self-contained room for students with moderate and severe disabilities with time spent with the general education students indicated on each student's individual education plan.

Four typically developing peers from the general education classrooms were chosen for the study based on the general education teacher's recommendation with criteria provided by the special education teacher. Participants from the general education classroom were selected to participate if they (a) were a member of the same general education classroom in which the participants with ASD participated, (b) had consistent attendance, (c) maintained appropriate classroom behavior, and (d) were able to identify the vocabulary terms they would be teaching, and (e) elementary aged students (6-11

years old). The peers selected were then asked if they were interested in working with students with ASD and the study was explained to them. If they wanted to participate, their parents were asked to provide consent, and student assent was obtained.

Students with ASD were included in this study if they (a) received more than 80% of their education in the investigator's special education, self-contained classroom which was determined through the school districts placement specialist as well as the student's individual education plan, (b) attended class with typically developing peers at least one time per instructional day, (c) were between the ages of 6-11 years-of age, (d) had a primary diagnosis of ASD, (e) were able to verbally imitate an oral response, (f) were able to sit and attend to a task for at least 10 min, (g) had communication disorder and received speech therapy and (h) had consistent attendance. The students were asked if they were interested in learning with a peer while using an iPad. If they wanted to participate, their parents were asked to provide consent, and student assent was obtained.

**Dyad 1: Jordan and Travis.** Travis was selected to work with Jordan. Travis was a 10-year-old male student in the fifth grade general education class. Travis was on grade level for all academic areas. Travis and Jordan participate in related arts classes together one time during instructional day. Travis was a member of the school safety patrol organization including helping with arrival procedures for the SWD.

Jordan was a 11-year-old male in the fifth grade. Jordan obtained a full-scale IQ score of 53 on the *Stanford-Binet Intelligence Scale, Fifth Edition (SB5)*. Jordan's overall score puts him in the well below average range and in the first percentile when compared to his same aged peers on cognitive functioning. Jordan demonstrated he enjoyed learning by participating in learning activities and completing his work. However, if Jordan did not

understand a task he demonstrated frustration by yelling out and removing himself from the activity. He was encouraged to ask for help or a model when he was confused. Jordan did not interact with his peers in the general education classroom and would become uncomfortable during social interactions often throwing his hands in the air and saying “I don’t know” when involved in social interactions requiring him to use expressive language. Some of Jordan’s individualized education program (IEP) objectives included formulating sentences based on pictures, answering questions after reading adapted texts, performing multiplication problems, and conversation skills. Jordan received both school based and outside speech language therapy services. Jordan continued to struggle answering open ended questions including questions targeting who, what, where, when and why. Jordan enjoyed using technology including the computer and an iPad. Jordan had received instruction using response prompting procedures including the SP procedure since kindergarten.

**Dyad 2: Peter and Kayla.** Kayla was selected to work with Peter. Kayla was a 10-year-old female student in the fifth grade general education class. Kayla was on grade level for all academic areas. Kayla was described by her teachers as a good candidate because she had good social skills in the classroom with her peers. Kayla and Paul attended the same special area classes together and were both members of the school safety patrol organization.

Peter was a 11-year-old male with a primary diagnosis of ASD in the fifth grade. Peter obtained a full-scale IQ score of 52 on the SB5 designed to assess his current cognitive functioning which puts him well below average compared to his same aged peers. Peter was an outgoing student that enjoyed interacting with peers and adults

throughout the school building. He also was a member of the school's safety patrol program before school. Some of Peter's current IEP goals included counting mixed change, identifying the main idea about a text, and formulating sentences based on a picture or topic. Peter received speech language therapy services to address initiating social interactions appropriately, responding to interactions appropriately, and remaining on topic. Peter had prior experience using technology including independently manipulating iPad applications and looking up videos on YouTube. Peter had received instruction using the SP and other response prompting procedures for 5 years.

**Dyad 3: Jen and Alex.** Alex was paired to work with Jen. Alex was a 6-year-old female in the first grade general education classroom. Alex was on grade level on all academic areas. Alex enjoyed helping out in her classroom by helping students on academic tasks and also enjoyed a leadership role by performing tasks assigned by her teacher.

Jen was a 6-year-old female in the first grade who had a diagnosis of ASD. She participated in the general education classroom once each school day for special classes. Some of her goals on her IEP included answering WH questions, completing simple addition problems, copying letters, taking turns, and asking for help. Jen was routine oriented and would cry, scream, and hit self on the head when routines were changed. Jen did not interact with her peers unless prompted by an adult. Jen had prior use of using technology including the iPad and computer. She had received instruction using the SP procedure and other response prompting procedures for 1 year. Jen rarely initiated social interactions and responded to interactions in one word phrases.

**Dyad 4: Mason and Morgan.** Morgan was a 6-year-old female in the first grade general education classroom. Morgan was on grade level on all academic areas. Morgan had a speech language impairment. She exhibited a delay in area of speech sound production and received speech services weekly.

Mason was a 6-yearold male in the first grade who had a diagnosis of ASD. Mason received more than 80% of his daily instruction in the special education classroom. Mason attended a general education classroom for related arts activities and for a small reading group each day. Some of his academic goals indicated on his IEP included answering WH questions, simple addition and subtraction, and tracing letters. Mason had prior experience using an iPad at school and at home. He had received instruction using the SP procedure and other response prompting procedures for 1 year. Mason had deficits in receptive and expressive language and received speech therapy two times a week. Mason rarely initiated interactions with peers and often did not respond to initiations made by others.

**Staff.** The special education teacher, who served as the investigator, collected data on full probe, daily probe, and maintenance sessions while in the self-contained classroom. The investigator had 6 years of experience working with students with moderate and severe disabilities. The investigator received her undergraduate degree in special education working with students with moderate and severe disabilities and was currently working toward a master's degree in special education. The investigator taught Jordan and Peter for 5 years and taught Mason and Jen for 2 years. Prior to the beginning of the study, the investigator had no previous experience working with the peers with typical development.

The paraeducator served as the reliability observer throughout the study. The paraeducator worked with SWD for 3 years. The paraeducator worked with Jordan and Peter for 3 years and with Mason and Jen for 2 years. He had prior experience in data collection and systematic instruction.

Table 1

<i>Dyad Descriptions</i> <small>Assessment Information</small>						
Dyad	Student with ASD Name Race	Age Grade	Assessment Information	Communication Information	Peer Name Race	Age Grade
1	Jordan Caucasian	11 years 4 months 5 <sup>th</sup> grade	Full-scale IQ score 53	CD Received speech therapy in school 2x a week	Travis Caucasian	<u>10 year 8</u> month 5 <sup>th</sup> grade
2	Peter African- American	11 years 1 months 5 <sup>th</sup> grade	Full-scale IQ score 52	CD Received speech therapy in school 2x a week.	Kayla Caucasian	<u>10 year 9</u> month 5 <sup>th</sup> grade
3	Jen Caucasian	6 years 10 months 1 <sup>st</sup> grade	GAC 54	CD Received speech therapy in school 2x a week	Alex Caucasian	<u>6 year 9</u> month 1 <sup>st</sup> grade
4	Mason Caucasian	6 years 7 months 1 <sup>st</sup> grade	NA	CD Received speech therapy in school 2x a week	Morgan Caucasian	<u>6 year 9</u> month 1 <sup>st</sup> grade

*Note.* ASD = Autism Spectrum Disorder; NA = score not available; GAC = General Adaptive Composite

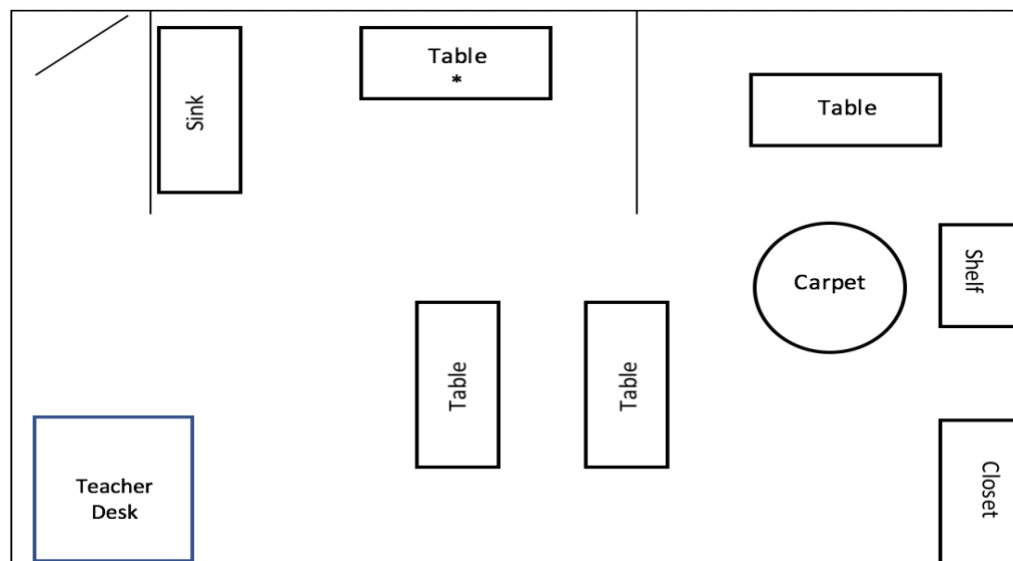
<sup>a</sup> Assessed using Stanford-Binet Intelligence Scale, Fifth Edition (SB5) (Roid, 2003).

<sup>b</sup> Assessed using Adaptive Behavior Assessment System, Second Edition (ABAS-II) (Harrison & Oakland, 2008).

## Setting and Instructional Arrangement

The study was conducted at an urban elementary school in the Southeast region of the United States. The school served students enrolled in Kindergarten through fifth grade classes, with 573 total students in the school. The demographic composition of the school was 77% White, 17% African-American, 3% Hispanic, and 6% other. A total of 56% of children qualified for free and reduced lunch. All sessions were conducted in the special

education classroom (7.9 m x 9.1 m) at the public elementary school. This classroom was staffed by one teacher and two paraeducators and had a total of nine students. The investigator collected all screening, full probe, daily probe, and observational learning data in a one-to-one setting with each student at a table in the back of the room. A diagram of the setting in the self-contained room can be found in Figure 1. The investigator collected all daily probe sessions in the mornings, before lunch and the students worked with their peer from the general education classroom in the afternoon. Training sessions were conducted in the special education classroom at a table in the back of the room. All students sat beside their peer facing away from the room while other students in the class were working with adults in other areas of the classroom.



*Figure 1.* Special Education Classroom. This figure illustrates the layout of the special education self-contained classroom. The \* indicates the area in which all sessions occurred.

### **Materials and Equipment**

Multiple materials and equipment were used in during this study. The investigator created PowerPoint presentations that were used by the students to deliver the instructional trials. Words typed in the PowerPoint presentations were typed using Times New Roman font and varying degrees of font sizes to display proportionately on the iPad screen. Pictures included in the presentations were obtained through Google images. The presentations were displayed on an iPad Air 2 for full probe, daily probe, intermittent probe, pretest/posttest, instructional sessions, and observational learning probes. The iPad was 6.1mm in thickness and weighed .96 pounds. The screen dimension was 238.76 mm by 167.64 mm. A *Finite* leather case was used for protection. It was 246.38 mm with an attached stand for easy viewing.

#### **Dependent Variable/ Target Skill/Instructional Objective**

**Students with ASD academic targets.** The primary dependent variable for the study was the percentage of correct responses of identification of target vocabulary. The instructional objective was as follows for all participants: When given a vocabulary definition presented on the iPad visually and orally along with a picture the student will orally state the correct vocabulary word within 3 s of seeing and hearing the definition with 100% accuracy for 3 consecutive sessions.

The list of vocabulary words that was taught to the fifth grade SWD and those taught to first grade students are shown in Tables 2 and 3 respectively. The rationale for the chosen target vocabulary was based on the social studies curriculum guide provided in the district. Target vocabulary for fifth grade SWD was based on map skills and was content already taught to the SWOD. Target vocabulary for SWOD in the fifth grade was based on economy because they had not learned and would likely not be taught until after



the conclusion of the study, which helped control threats to internal validity. SWD and SWOD in the first grade were learning vocabulary associated with their community and safety.

Discrete trial data collection was used to measure student responding during full probe, daily probe, and intermittent probe sessions. The possible responses included correct, incorrect, and no response. A *correct response* was defined as the student saying the correct vocabulary word within 3 s of the task direction and presentation of the stimulus. An *incorrect response* was defined as the student saying a word other than the correct one within 3 s of the task direction. A *no response* was defined as the student not saying anything within 3 s of the presentation of the task direction. Student responses were only recorded during full probe, daily probe, intermittent probe, observational learning pretest/posttests, that were conducted by the investigator following the same target behavior.

**Students without disabilities academic targets.** SWOD were tested on the percent of correct responses of identification of target vocabulary using a pretest and posttest. A pretest was administered prior to the SWD receiving instruction in a single tier. A posttest was administered after the SWD they were paired with reached criterion in a single tier or every 2 weeks. If the SWD did not reach criterion within 2 weeks, the SWOD was given a posttest to determine mastery on their list of words. If the SWOD mastered their target vocabulary, a new list of vocabulary would be implemented to avoid over learning. If they did not reach mastery, the SWOD continued to learn the current vocabulary being taught by the SWD. This was repeated until the SWD mastered all three tiers. Identifying target vocabulary and possible responses were the same as SWD. The

lists of vocabulary taught to SWOD in fifth and first grade is shown in Tables 4 and 5 respectively.

**Social interactions.** During each instructional session, data were collected on each dyad's social interactions during instruction. The social interaction objective was defined as when preferred characters were embedded into the trials would a social interaction occur between the SWD and SWOD. A social interaction was measured following presentation of a preferred character was presented, on an iPad and was defined as a verbal initiation directed to a peer followed by a verbal response from the other peer within 4 seconds. If a social interaction occurred, it was labeled either related or unrelated. A verbal initiation followed by a response about the character was labeled related. A verbal initiation followed by a response about topics other than the character were labeled unrelated. Data were recorded as follows: + = Interaction occurred, - = An interaction did not occur. When an interaction occurred a R = related the character and U = unrelated.

Table2

*Vocabulary Words, Photo Descriptions, and Definitions Used in Presentation*

Tier	Vocabulary Words	Description of Photo	Definition	
Tier 1	1	Compass Rose	A compass rose symbol	Symbol on a map that provides directions
	2	Equator	Picture of earth with a red line indicating the equator	The imaginary line around the earth dividing the north and south
	3	Map Key	A map key containing symbols for mountains, capital, etc.	Tool that explains what symbols on a map stand for
	4	4 oceans	Picture of earth	The number of oceans
Tier 2	1	7 continents	7 continents not labeled	The number of continents
	2	Atlantic Ocean	United States with x of ocean location	The ocean on east side of America
	3	Pacific Ocean	United State with x of ocean location	The ocean on the west side of America
	4	Island	Island surrounded by water	A piece of land surrounded by water
Tier 3	1	Rocky Mountains	United States with mountains and x to depict location	Mountain range on the west side of America
	2	Appalachian Mountains	As above	Mountain range on the east side of America
	3	Mexico	North America with country shaded in red	Country south of America
	4	Canada	As above	Country north of America

Table 3

*Vocabulary Words, Photo Descriptions, and definition for Jen and Mason*

Tier	Vocabulary Words	Description of Photo	Definition	
Tier 1	1	Emergency	Ambulance, fire truck, & police car	A sudden dangerous situation
	2	Danger	An angry dog & an outlet	Something that might hurt you
	3	911	Symbol for emergency telephone	The number you call when you are in danger or hurt
Tier 2	1	Hospital	Hospital community sign	Place you go when you are hurt or sick
	2	Exit	Emergency exit sign	The way to get out of a building
	3	Wet Floor	Sign for wet floor	What does a sign with a person falling warn you about
Tier 3	1	Cross Walk	Cross walk community sign	Sign that tells you where to cross a street
	2	Walk	Walk sign	Sign that tells you it is safe to cross the street
	3	Don't walk	Don't walk sign	Sign that tells you not to cross the street.

Table 4

*Vocabulary Words, Photo Descriptions, and Definitions Used in Presentation*

+	Tier	Vocabulary Words	Description of Photo	Definition
	List 1 1	Community	Town	A place where people live, work, and play together
	2	Directions	Compass <u>rose</u>	The way you go to get to another place
	3	Rules	Check mark	A set of guidelines we must follow
	4	Kentucky	Outline of Kentucky	The state that you live in
	List 2 1	Want	Puppy	Something that you would like to have
	2	Need	Food	Something that you must have to live
	3	Goods	Food and toys	Things that you can buy with money
	4	Service	Worker	Doing work for someone in exchange for money
	List 3 1	Population	People	All the people who live in a town or country
	2	Symbol	Statue of liberty	Something that stands for something else
	3	Culture	People holding hands	A group of people's beliefs and traditions
	4	History	Pilgrim and Indians	Something that already happened at an earlier time

□

Table 5

*Vocabulary Words and Definitions Used in Presentation*

Tier	Vocabulary Words	Definition
<b>List 1</b>		
1	Mass Production	Making many products at once
2	Prosperity	Economic success and security
3	Entrepreneur	One who organizes, manages, and assumes the risk of a business
4	Economy	A system in which money is earned and exchanged for goods and services
5	Monopoly	A company that has no competition
6	Industry	Businesses that make one kind of product or provide one kind of service
7	Consumer	A person who buys a good or a service
8	Inflation	The rise in prices of goods
<b>List 2</b>		
1	Export	Product that we send to another country to sell
2	Invest	To put money into something to try to earn more money
3	Scarcity	The problem of not having as much of something as people would like
4	Deficit	Spending more money than you have earned
5	Supply	The amount of a product being sold at a certain price
6	Human Resource	Person who brings skills and knowledge to a job
7	Productivity	Amount of goods and services made by workers in a certain amount of time
8	Import	Product brought into the county to sell
<b>List 3</b>		
1	Population	What you give up when you decide to do or have something else
2	Conservation	Protection and wise use of natural resources
3	Budget	A plan for saving and spending money
4	Capitalism	When people and businesses decide what goods and services to make and sell
5	Manufacture	Someone who uses machines to make goods
6	Demand	The amount of something that people want to buy at certain prices
7	Industrial Revolution	A period of time marked by change in manufacturing and transportation
8	Citizen	Official member of a city, state, or nation

## Rationale

The list of vocabulary words selected for each student were selected based on grade level social studies content vocabulary. First grade vocabulary lists targeted words seen in their environment to promote safety. Fifth grade words targeted vocabulary words and symbols that related to geography and map skills.

## Screening Procedures

Prior to instruction, the investigator worked with the general education teacher to gather a list of vocabulary words the SWOD were expected to learn but had not been taught and would not be taught until later in the school year (after the study was finished). The investigator gathered a list of grade level vocabulary words from the social studies curriculum taught earlier in the year to SWOD.

The investigator conducted screening sessions to ensure the students could not identify the vocabulary words when given the definition. There was one trial per stimulus during each session. The investigator ran massed trials with each student. At least two screening sessions were conducted or until the designated number of vocabulary words were identified that the student could not identify during the two screening sessions. The total number of stimuli gathered to be included in the study were as follows: SWOD in the fifth grade would learn 24 stimuli, SWOD in first grade would learn 12 stimuli, SWD in the fifth grade would learn 12 stimuli, and SWD in the first grade would learn 9 stimuli. .

The investigator delivered the attending cue, “Okay, I am going to test you on some vocabulary words now”. The teacher ensured an attending response by the student nodding their head or verbally indicating they were ready. The investigator orally delivered the task direction, “What word is (definition)” while showing a picture that represented the definition. The investigator waited 3 s for a student response. The teacher marked the student as correct, incorrect, or no response. The investigator verbally praised correct responses (e.g., “Good Job). If no response or incorrect responses occurred, the teacher did not comment marked the appropriate mark and moved to the next trial.

## **Experimental Design**

A multiple probe (days) design across behaviors replicated across students was used to evaluate in the study (Gast & Ledford, 2014). Experimental control was demonstrated when the percentage of accurate student responses increased when and only when the independent variable was introduced. Procedural fidelity and interobserver agreement reliability data were collected to control threats to the internal validity. Intermittent probe sessions were conducted on at least 20% of sessions to report progress on all tiers and to demonstrate independence between the conditions. .

The investigator conducted five full probe sessions on SWD, or until data were stable; sessions were conducted before the daily probe sessions occurred. First, SWD had full probe sessions in which they were assessed on all of the vocabulary words in the study. Twelve vocabulary terms were presented twice during the session for a total of 24 trials for fifth grade SWD. Nine vocabulary terms were presented twice during the session for a total of 18 trials for first grade SWD. Then, peers taught the first set of vocabulary words while the teacher conducted daily probe sessions. During the daily probe sessions and instructional sessions, students had a total of 12 trials. The criterion was 100% accuracy over 3 consecutive sessions. Once criterion was met on the first tier of vocabulary words, the investigator conducted at least 3 sessions or until data were stable on Tier 2. The investigator began daily probe sessions on the second tier of vocabulary words and repeated the same procedures until all the vocabulary words were learned to criterion. The investigator conducted Intermittent probe sessions on untrained stimuli at least once every 5 sessions.



SWOD were given a pretest prior to instructional sessions taken place within each tier. A posttest was administered when the SWD reached criterion in a single tier or every 2 weeks.

### **General Procedures**

The purpose of this study was to use technology and the SP procedures to teach three sets of social studies vocabulary to four elementary school SWD. The investigator used SWOD and the SP procedures presented through the iPad as the independent variable and a multiple probe across behaviors experimental design. SWD acted as the tutor and tutee when they worked with their peer without disabilities. Three tiers were assigned to each SWD dividing the total number of vocabulary into three sets. A pretest/posttest was administered to the peer without disabilities on the words they learned from their peer with ASD. A pretest and posttest were administered to the SWD on the vocabulary they taught their peer to test the effects of observational learning. Additionally, the investigator assessed social interactions between students with and without ASD when preferred characters were presented as a consequence during instructional sessions.

### **Tutor Training Sessions**

**Peer training sessions.** The investigator taught all the SWOD how to reliably conduct the SP instructional trial. Training sessions occurred in the special education classroom before they began working with the SWD. To teach the peers to conduct trials, the investigator first modeled one full session with the peer tutor. The investigator conducted one full session with the peer tutor by having the peer tutor play the role of the SWD and the investigator modeled the role of the SWOD using the SP procedures. The

peer was shown how to access the PowerPoint app, access the correct presentation, put the presentation in slide show format, present the stimuli and controlling prompt, deliver the appropriate response, and use response times. Once the investigator modeled one full session, the investigator asked the peer tutor to take the role of the SWOD and model the steps of the procedure. The peer tutor modeled one full session with the investigator as she played the role of the SWD. The investigator prompted the peer tutor after any incorrect steps and gave descriptive praise once the session had ended. The investigator continued these sessions with the SWOD until they reliably implemented each procedural step at 90% accuracy for greater.

The behaviors on which the peer was assessed included: (a) opening the PowerPoint app on the iPad, (b) opening correct PowerPoint file, (c) putting the presentation in slide show format, (d) deliver attending cue, (e) swiping the iPad to provide stimuli and task direction, (f) immediately delivering the controlling prompt as it appeared on screen, (g) delivering the appropriate consequence (verbally praising correct responses and pressing a button on the iPad to redeliver the task direction and controlling prompt again for no response and incorrect responses), and (h) pressing button to advance presentation. The SWOD were not trained on data collection as they were not required to collect data during instructional trials. The data sheet used to collect procedural fidelity on training sessions is shown in Appendix A.

**Students with ASD training sessions.** The investigator taught all the SWD how to reliably conduct the SP instructional trials using the iPad. Training sessions occurred in the special education classroom before they received instruction from their peer. To teach the SWD to conduct trials, the investigator first modeled one full session with the student.

The investigator conducted one full session with the SWD by delivering the presentation to a paraeducator in the classroom and having the SWD watch. The student was shown how to access the PowerPoint app, access the correct presentation, put the presentation in slide show format, present the stimuli and controlling prompt, deliver the appropriate response, and advance to the next slide. Once the investigator modeled one full session, the investigator asked the student to take the role of the teacher and model the steps of the procedure. The student modeled one full session with the investigator as she played the role of the SWOD. The investigator prompted the student after an incorrect step including verbal and physical prompts. The investigator gave descriptive praise once the session had ended. The investigator continued these sessions with the SWD until they reliably implemented each procedural step at 90% accuracy for greater. The behaviors on which the SWD was assessed were the same as the SWOD.

### **Probe Procedures**

**Full probe procedures for ASD.** The investigator conducted full probe sessions in a one-to-one instructional arrangement in the special education classroom for a minimum of 5 consecutive probe sessions and until all data were stable across three tiers. Fifth grade SWD learned four vocabulary words in each tier during the study. First grade SWD learned three vocabulary words in each tier during the study. In all full probe sessions, all words were presented twice. There was a total of 24 trials presented to fifth grade students per session and 18 trials presented to first grade students per session. The data sheet that was used to collect data during full probe sessions is in Appendix B.

The investigator conducted the probe sessions by accessing the appropriate PowerPoint presentation on the iPad and put the presentation in slide show format. The

investigator delivered the attentional cue of “Okay, we are going to test you on some vocabulary words now”. She then ensured the student made a verbal (i.e., stating they were ready) or non-verbal (i.e., head nod) attentional response. The investigator used her finger to swipe across the screen of the iPad that delivered the task direction paired with the stimuli and waited 3 s for a student response. The investigator provided verbal praise for correct responses (e.g., “Good Job”). If the student responded with an incorrect response or no response, the teacher did not comment, marked the data sheet accordingly, and moved to the next trial.

**Daily probe procedures.** During the daily probe procedures, the investigator collected data only on stimuli that were receiving instruction prior to each training session, until the student mastered the selected vocabulary words. Daily probe sessions occurred before the student received instruction from their peer. Twelve trials were presented during each session. First grade SWD were tested on 3 stimuli 4 times per session and fifth grade SWD were tested on 4 stimuli 3 times per session. The procedures were conducted the same manner as full probe sessions. The data sheet used for data collection on daily probe sessions is shown in Appendix C.

**Intermittent probe procedures.** The investigator conducted intermittent probes on untrained stimuli. Intermittent probes were conducted at least one time per week. Intermittent probes were conducted the same as daily probe sessions. Twelve trials were presented during each session. Sessions followed the same procedures as during the full probe sessions. The procedure was conducted exactly like full probe procedures. The data sheet used for data collection during intermittent probe sessions is shown in Appendix C.

### **Pretest/Posttest/Observational Learning Procedures**

Students with and without disabilities were given a pretest prior to implementing instruction in each tier set. The pretest was administered to SWOD on the current set of words they would be taught from the SWD. The SWD was also given a pretest on the words they would be teaching to the SWOD to allow for observational learning data to be collected after instruction. Each vocabulary word was presented one time during the pretest. Students in the fifth grade were tested on eight words and first grade students were tested on four. The pretest was delivered in the same format as probe procedures.

After a student with disabilities reached criterion in one tier, a post test was administered to the SWOD on the vocabulary they were taught from the student with disabilities. A posttest also was administered to the student with disabilities to test for observational learning. The post test was delivered in the same format as pretest and probe procedures. The data were collected on the same data sheets used for daily probe and intermittent probe sessions shown in Appendix C.

### **Instructional Procedures**

**Peers without disabilities as tutors.** Instructional sessions were implemented once full probe sessions were complete. The SWOD delivered instructional trials on one vocabulary word set at a time until the criterion was met on that set. The SWOD delivered instructional sessions in the special education classroom after the investigator conducted daily probe sessions and intermittent probe sessions. The SWOD conducted instructional sessions daily. The SWOD presented 12 trials to the SWD using the iPad and the sequence they had been taught during tutor training sessions. Fifth grade students delivered four stimuli three times per session and first grade students delivered three stimuli four times per session. The SWOD did not collect data during the instructional

trials. During instructional sessions the SWOD opened the PowerPoint app on the iPad, opened the correct PowerPoint file, put the presentation in slide show format, delivered the attending cue which was displayed on the iPad, swiped the iPad to provide the stimuli and task direction, immediately delivered the controlling prompt as it appeared on screen, and delivered the appropriate consequence. The SWOD verbally praised the correct responses on all trials (e.g., “Good job”). If the student did not respond or responded incorrectly then the peer touched a button to redeliver the stimuli and task direction, then redelivered the controlling prompt and moved on to the next trial.

**Peers with disabilities as tutors.** The SWOD and SWD took turns providing instruction during each session. Once the peer without disabilities had completed instructional procedures in a session, the SWD would provide instruction to their peer in the special education classroom daily. Fifth grade students had 16 trials per session: two trials per stimulus. First grade students had 12 trials per session: three per stimulus. During instructional sessions the student with disabilities opened the PowerPoint app on the iPad, opened the correct PowerPoint file, put the presentation in slide show format, swiped to trigger the task direction, presentation of stimulus, and the timed controlling prompt. Fifth grade SWD verbally praised the correct responses on all trials (e.g., Good job). If the student did not respond or responded incorrectly then the student touched a button to redeliver the stimuli and task direction, then redelivered the controlling prompt and moved on to the next trial. After the task direction was given and the stimuli was presented, SWD in the first grade pushed a button to provide the correct consequence. When the button was pushed, the iPad orally delivered the consequence, “If you said

(correct answer) good job, if you didn't say (correct answer), the answer is (correct answer)".

### **Social Interactions Procedures**

**Baseline.** Baseline data were collected on the first five instructional sessions to determine whether the introduction of preferred characters would result in social exchanges between SWOD and SWD while working together. Characters were introduced on four occasions during instructional sessions to determine whether social interactions and responses would increase when a preferred character was included. All dyads had four trials: 2 trials while the student without a disability provided instruction and 2 trials while the student with a disability provided instruction. The slides containing the preferred character were on a 30 s delay to allow for interactions.

**Intervention.** A system of least prompts procedure (SLP) was introduced after 5 days of instructions if there was not an increase in social interactions when preferred characters were introduced. When the slide containing the character appeared on the pair of students had 5 s to initiate an interaction. After 5 s the teacher provided an indirect verbal prompt (IV), "You can talk to each other right now." The teacher waited another 5 s to allow for a social exchange. If the students still did not interact, the teacher verbally modeled the behavior to the SWD "Say, do you like Sponge Bob?". The data sheet used to collect data on social interactions is shown in Appendix D.

### **Reliability**

The paraeducator and the teacher collected procedural fidelity data. Procedural fidelity and IOA data were collected on 47% of full probe, daily probe, and intermittent probe sessions. Procedural fidelity and IOA were collected on 100% of pretest, posttest,

and observational learning sessions, which were administered to SWOD and SWD on the vocabulary taught to the SWOD. Procedural fidelity and IOA on social interactions was collected on 31% of instructional sessions. The teacher collected procedural fidelity on students implementing instruction procedures on 73% of instructional sessions.

The paraeducator was trained to collect these data and collected data while working with the teacher in the study until a minimum of 80% reliability was obtained. The paraeducator collected reliability data on full probe, daily probe, intermittent probe, observational learning probes, pretest and posttests. The paraeducator was trained by the investigator before the study began. If reliability checks dropped below 80%, the observer was retrained before conducting reliability observation. The teacher collected reliability data during instructional sessions. Social training was implemented by discussing with the paraprofessional on what constituted a social interaction.

**Procedural fidelity of investigator's delivery of training procedures.** The paraeducator collected procedural fidelity on the investigator's delivery of tutor training sessions to SWD and their peers. The data sheet used for training sessions is shown in Appendix A. The investigator was monitored on the delivery of training procedures including the following behaviors: model the instructional practice including consequences for all response types, lead the student through the instruction by praising correct behaviors and providing corrective feedback, and testing the student on delivering the instructional procedure. The teacher implemented training procedures with 100% fidelity on all training procedures.

**Procedural fidelity of investigator delivery of probe procedures.** Procedural fidelity data on the investigator's delivery of full probe, daily probe, intermittent probes,



and pretest and posttest was completed by the paraeducator. The following investigator behaviors were assessed: (a) delivered a general attentional cue, (b) ensuring an attentional response, (c) swiping iPad to deliver the task direction and present stimuli, (d) waiting for a student response within the correct time interval, (e) delivering the appropriate consequence. The data sheet used for probe procedures is shown in Appendix E. Procedural fidelity was collected on 47% of probe sessions. Procedural fidelity was 99% across all procedures.

**Interobserver agreement on probe procedures.** The paraeducator collected interobserver agreement data during probe sessions. The paraeducator collected data for 20% of sessions. Interobserver agreement were calculated using the point-by-point method using the following formula: The number of agreements divided by the number of agreements plus disagreements multiplied by 100 (Gast & Ledford, 2014). Interobserver agreement was 98% during all probe sessions. Interobserver agreement data was collected during probe procedures using the data sheet shown in Appendix E.

**Procedural fidelity of SWOD as tutor's delivery of instructional procedures.** The teacher assessed the peer's use of the independent variable for 100% of the sessions. She measured the occurrence of the following: (a) student accessing the materials, (b) delivering the attending cue, "Are you ready?", (c) provide task direction and stimuli, (d) delivering the controlling prompt within the correct time interval, (e) delivering the appropriate consequence. The results indicated that SWOD implemented instructional procedures with 98% fidelity. The data sheet used for instructional sessions is shown in Appendix F.

**Procedural fidelity of students SWD as tutors.** The teacher assessed the SWD's use of the independent variable for 100% of the sessions. She measured the occurrence of the following: (a) student accessing the materials, (b) delivering the attending cue, "Are you ready?", (c) provide task direction and stimuli, (d) delivering the controlling prompt within the correct time interval, (e) delivering the appropriate consequence. The data sheet used for data collection is shown in Appendix F. The results indicate that SWD were able to implement instructional procedures with 97% fidelity.

**Procedural fidelity of investigator's implementation of system of least prompts.** The paraeducator assessed the teacher's implementation of system of least prompts during instructional sessions for 20% of sessions. The paraeducator measured the occurrence of the following behaviors: Upon the presentation of the preferred character, the teacher waited 4 s to allow for an independent social interaction between the students. If no interaction occurred within 4 s, the teacher provided an indirect verbal prompt "You can talk to each other right now" and the teacher waited another 4 s for an interaction to occur. If no interaction occurred within 4 s, the teacher provided a verbal model to the student with disabilities (e.g., "Say, Do you like Spongebob?"). The investigator implemented the SLP procedure with 100% fidelity during instructional sessions. The teacher was able to implement the SLP procedure with 100% accuracy on all instructional sessions. The data sheet used was the same as the data collection on social interactions shown in Appendix D.

**Interobserver agreement on social interactions.** The paraeducator collected interobserver agreement on social interactions. The paraeducator collected data for 20% of sessions. Interobserver agreement were calculated using the point-by-point method

using the following formula: The number of agreements divided by the number of agreements plus disagreements and multiplied by 100 (Gast & Ledford, 2014).

Interobserver agreement was 100% during all instructional sessions. IOA on social interactions between SWD and SWOD was 100%.

## Section 4: Results

### SWD Target Behavior

The effectiveness data for Jordan, Peter, Jen, and Mason are shown in Figures 2, 3, 4, and 5 respectively. The data indicate that the SP procedure delivered by peers without disabilities was effective in teaching elementary-aged SWD grade level social studies vocabulary.

**Jordan.** Jordan's data indicated that during full probe sessions he was unable to identify any stimuli in Tier 1 or Tier 3. He was able to identify stimuli in Tier 2 with 25% during probe sessions. He had a rapidly accelerating trend all three tiers with the exception of the first one to two sessions per tier. He reached criterion levels in Tier 1 in 7 sessions and continued to maintain 100% on all intermittent sessions while he received instruction in Tier 2 or Tier 3. After Jordan reached criterion on Tier 1, three probe sessions were implemented on Tier 2 vocabulary. Jordan remained stable at 25% responding on Tier 2 before intervention was implemented. Jordan reached criterion in Tier 2 in 4 instructional sessions. Jordan remained at 0% on intermittent probes collected on Tier 3 before intervention was implemented. Once intervention was implemented, Jordan had an accelerating trend in Tier 3, reaching criterion in 5 instructional sessions.

**Peter.** Peter's data indicated that during 5 full probe sessions, he was unable to identify stimuli in Tier 1 or 3. He identified stimuli in Tier 2 at 17% one time before a decline back to 0%. When intervention was introduced on Tier 1 vocabulary, Peter had a zero-celerating, stable trend for four sessions, then had an accelerating trend that stabilized for three sessions, and an acceleration in trend before he mastered Tier 1 vocabulary words in 5 more sessions. Before intervention occurred in Tier 2, three

additional probe sessions were implemented. He scored a 17% on one session before he decreased back to 0%. Once intervention began, Peter had a rapidly accelerating trend before a decrease in trend. His responding stabilized and he eventually reached criterion in 14 sessions. He remained at 0% on Tier 3 vocabulary.

**Jen.** The data indicated that during full probe sessions, Jen was unable to identify any stimuli in Tiers 1, 2, or 3. Once intervention was introduced in Tier 1, she had a flat, stable trend for 2 sessions, an acceleration in trend on session 3, a de-escalation in trend on session 4. She finished with a rapidly, accelerating trend and mastered tier 1 words in 3 more sessions. After Jen reached criterion on Tier 1, three probe sessions were implemented on Tier 2 vocabulary. Jen remained stable at 0% responding on Tier 2 before intervention was implemented. Jordan reached criterion in Tier 2 in 6 instructional sessions. Once Jen reached criterion on Tier 2, she remained at 100% on Tier 1 and 0% on Tier 3 vocabulary. Jen had an accelerating trend on Tier 3 and reached criterion in 4 instructional sessions. She remained at 100% responding for Tiers 1 and 2.

**Mason.** The data indicated that during full probe sessions, Mason was unable to identify any stimuli in Tiers 1, 2 or 3. Once intervention was introduced in Tier 1, he had a flat, stable trend for 2 sessions, an acceleration in trend on session 3, a de-escalation in trend on session 4. He finished with a rapidly, accelerating trend and mastered tier 1 words in 3 more sessions. After Mason reached criterion on Tier 1, three probe sessions were implemented on Tier 2 vocabulary. Mason had two sessions he increased to 25% before a decline to 0%. Mason had an accelerating trend on Tier 2 and reached criterion in 5 instructional sessions. Mason remained at 100% on Tier 1 and 0% on Tier 3 vocabulary. He had an accelerating trend on Tier 3 and reached criterion in sessions.

## **SWOD Target Behavior**

A pretest was given prior to instructional sessions within each tier to SWOD. Data on the pretest and posttest is shown in Table 6. Travis scored a 0% on all pretests prior to instructional sessions. Travis scored a 38%, 25%, and 63% on the posttests following instruction from his peer with ASD. Kayla scored a 0% on all pretest prior to instructional sessions from her peer. Kayla participated in a posttest two times on her first list of vocabulary words. Once after 2 weeks of instructional sessions and once when he met mastery of Tier 1. After 2 weeks, Kayla was able to identify 38% of vocabulary words from list 1. After 13 sessions, she was able to identify all 8 stimuli from list 1. Kayla scored a 50% on the posttest following Tier 2. Alex scored a 0% on all pretests before instruction with her peer. She scored a 100% on two posttests and 50% on the third posttest. Morgan scored a 0% on all pretests before instruction with her peer. She scored a 100% on list one posttest and a 50% on the posttest for list 2.

## **PreTest/PostTest/Observational Learning**

The results of observational learning targets for SWD are shown in Table 5. The data indicate that SWD were able to learn some of their peers vocabulary words through observational learning. Jordan scored a 0% on all three pretests given before instruction in each tier. He scored 38%, 38% and 63% on posttests targeting observational learning data. Peter scored a 0% on all pretests given prior to intervention in each tier. He scored a 25% on the posttest at the completion of Tier 1, and a 13% on the posttest following Tier 2. Jen scored a 0% on all pretest given prior to instructional sessions. She scored 100% on all three posttests once she reached criterion in each tier. Mason scored a 0% on all

pretests given prior to instructional sessions. He scored a 100% on posttests following Tiers 1 and 2.

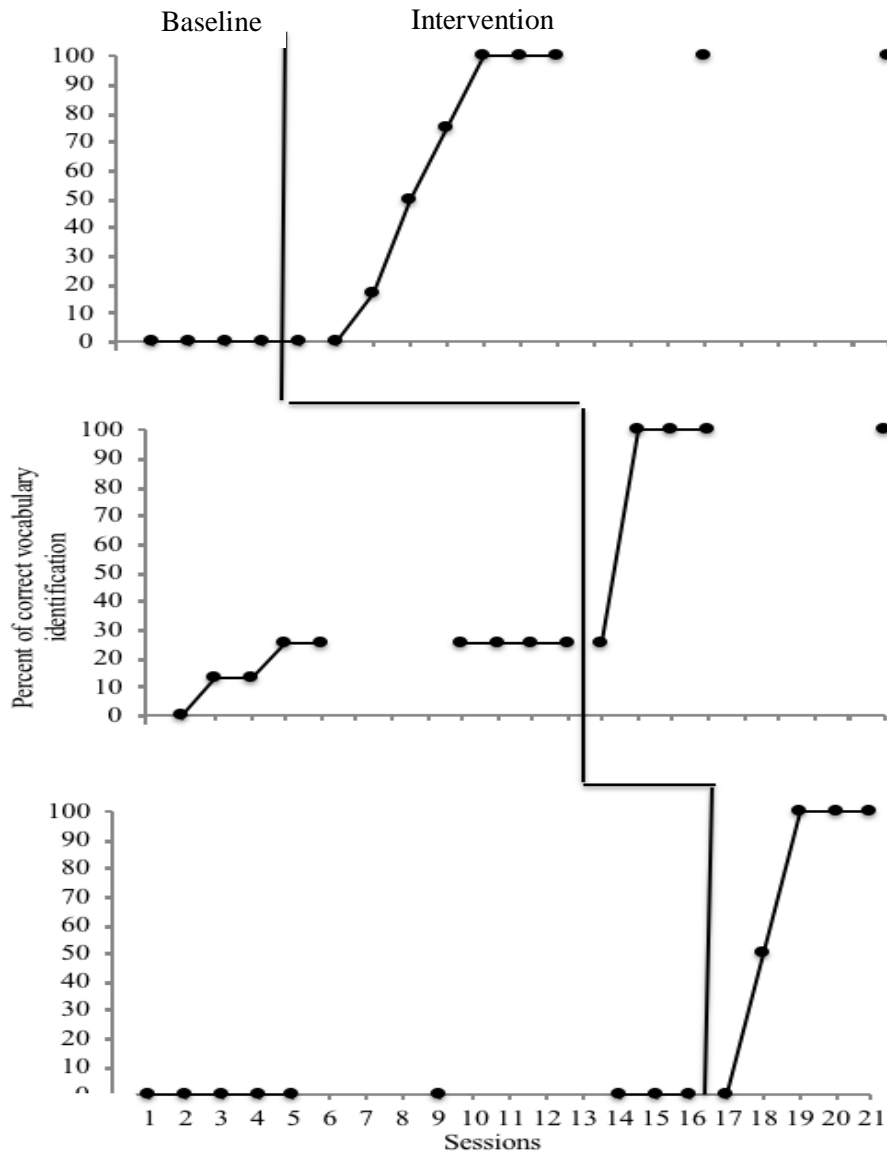


Figure 2. Percent of correct responses for Jordan.

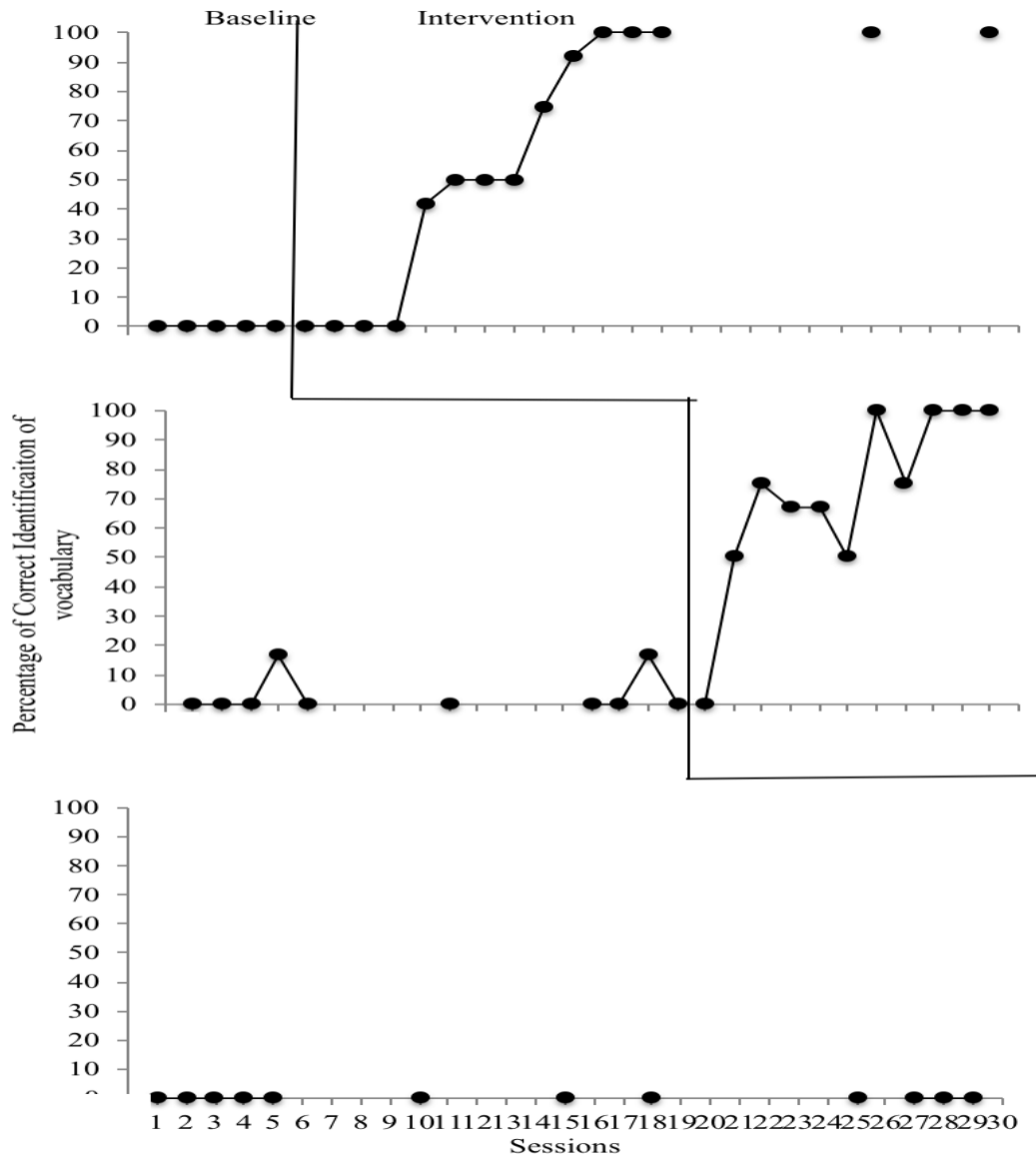


Figure 3. Percent of correct responses for Peter



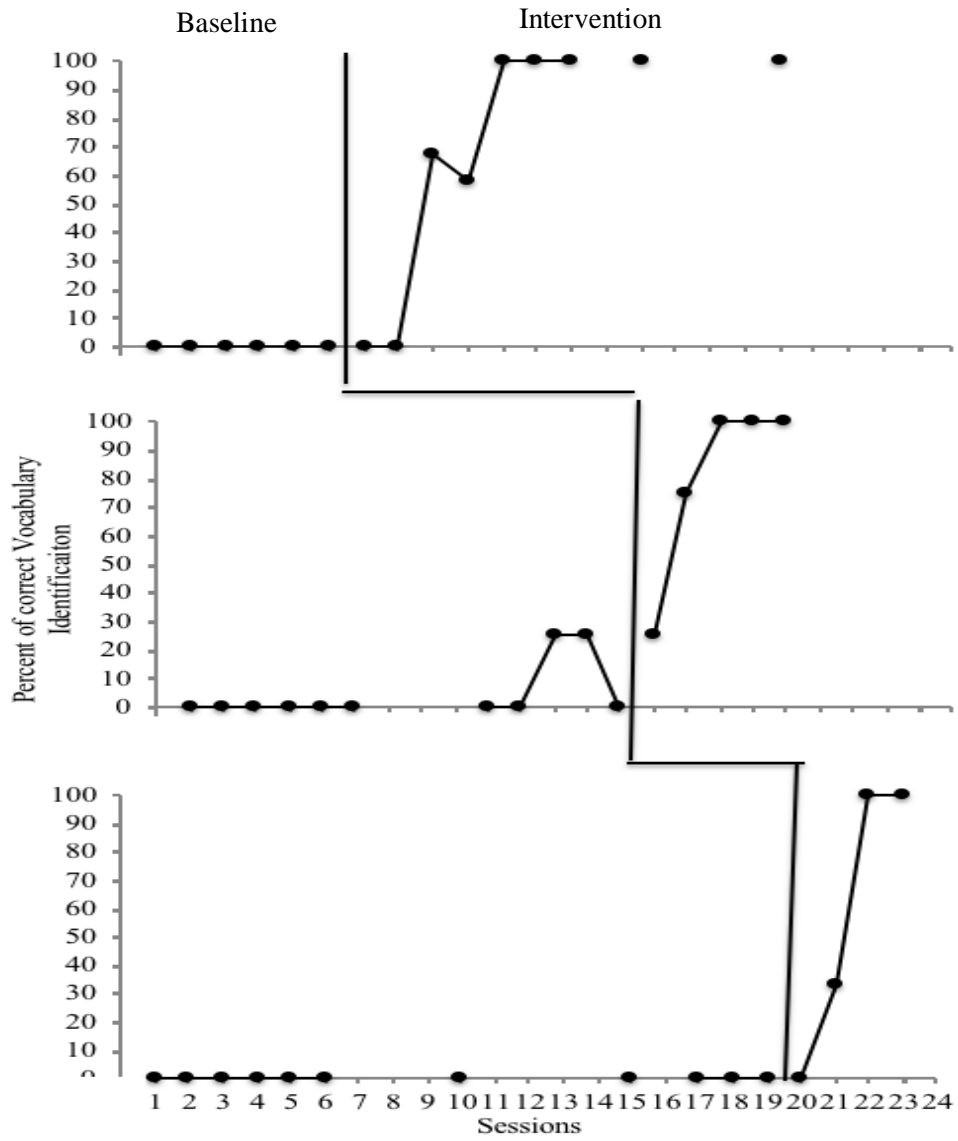


Figure 4. Percent of correct responses for Mason

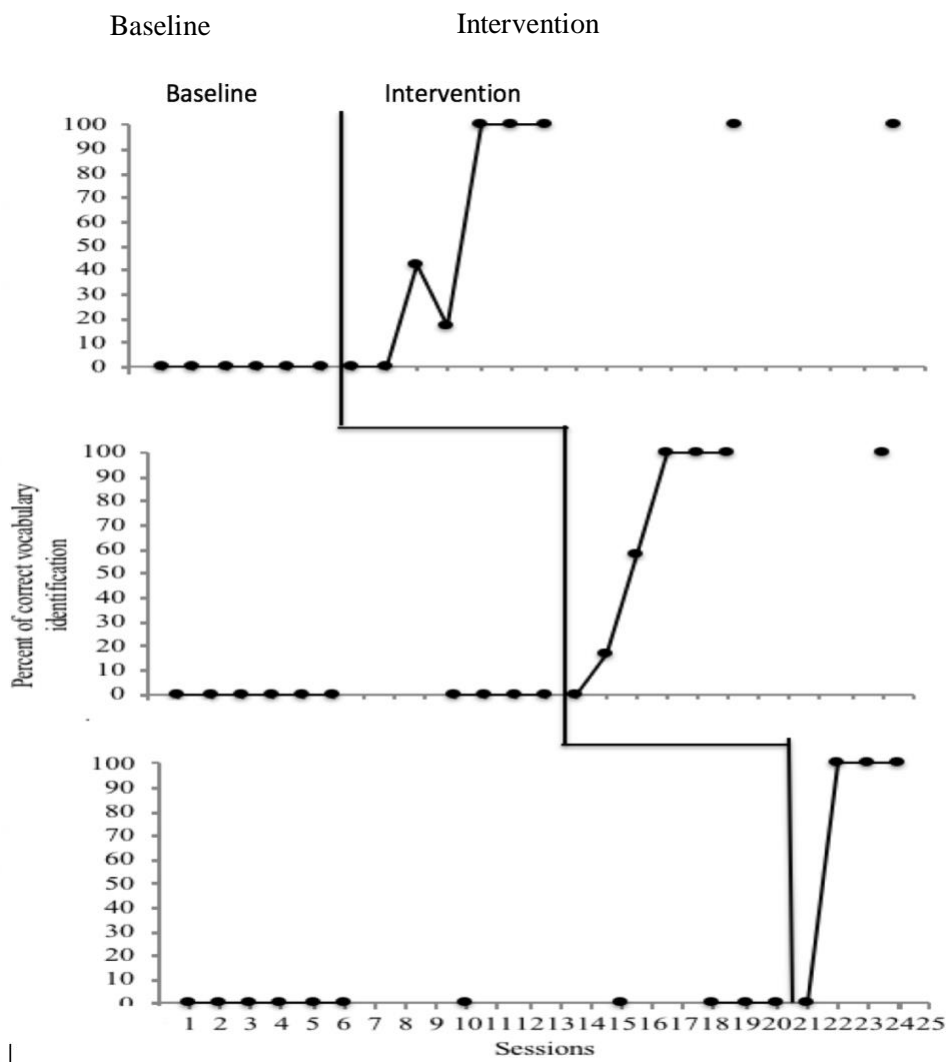


Figure 5. Percent of correct responses for Jen.

Table 6

*Effectiveness Data for Each Dyad*

Dyad SWD/SWOD Tier	Number of Instructional Sessions to Criterion	SWD Pretest/Posttest Observational Learning Percent	SWOD Pretest/Posttest Percent
<b>Jordan/Travis</b>			
1	7	0/38	0/38
2	4	0/38	0/25
3	5	0/63	0/63
	<b>Total: 16</b>		
<b>Peter/Kayla</b>			
1	13	0/25	0/100
2	11	0/13	0/50
3		0/	0/
	<b>Total: 24</b>		
<b>Jen/Alex</b>			
1	8	0/100	0/100
2	6	0/100	0/100
3	4	0/100	0/50
	<b>Total: 18</b>		
<b>Mason/Morgan</b>			
1	8	0/100	0/100
2	5	0/100	0/50
3	5	0/	0/
	<b>Total: 18</b>		

### Social Interactions SWD/SWOD

The data for social interactions for SWD and SWOD is shown using bar graphs to show the social interactions across conditions and to indicate if the interactions were related or unrelated to the character shown on the iPad.

**Jordan/Travis.** After 5 baseline sessions implemented in instructional sessions, 0 social interactions occurred when the preferred character was embedded in the trials. The SLP procedure was implemented on a single session in Tier 1 including 2 IV prompts resulting in social interactions, 1 M prompt, and one interaction occurred independently

(25% independent/unrelated). Social interactions continued in Tier 2, with 100% independence and 100% (?) unrelated. A change in the characters presented in Tier 3, instructional sessions resulted in 100% independent interactions and 100% related to the character. Data demonstrating the percent of independent social interactions between Jordan and Travis is shown in Figure 6.

**Peter/Kayla.** After 5 baseline sessions conducted in instructional sessions, Peter and Kayla had social interactions on 90% of provided opportunities. The pair had social interaction on 92% of opportunities across Tier 1. Eighty-five percent were considered to be related to the character presented and 15% was unrelated to the character. There was a decrease in social interactions in Tier 2 with 80% of interactions when the character was presented. 88% was considered related to the character and 12% of the interactions were unrelated. Data demonstrating the percent of independent social interactions between Peter and Kayla is shown in Figure 7.

**Mason/Morgan.** After 5 baseline sessions and only 5% social interactions, the SLP procedure was implemented. Tier 1 resulted in 25% independent social interactions related to the character. There were 87% independent social interactions in Tier 2 with 100% of the social interactions related to the character. Tier 3 there were 100% social interactions related to the character. Data demonstrating the percent of independent social interactions between Mason and Morgan is shown in Figure 8.

**Jen/Alex.** After 5 baseline sessions conducted, 0 social interactions occurred between the pair of students when the presentation of the character was embedded in the trials. The SLP procedure was implemented on two sessions while the SWD remained in Tier 1. Following the SLP procedure, there were 25% independent social interactions

between the students related to the character. Tier 2, the pair remained at 100% independent social interactions and 100% related to the character. There was a slight decline in Tier 3, with 66% independent social interactions were recorded related to the character. Data demonstrating the percent of independent social interactions between Jen and Alex is shown in Figure 9.

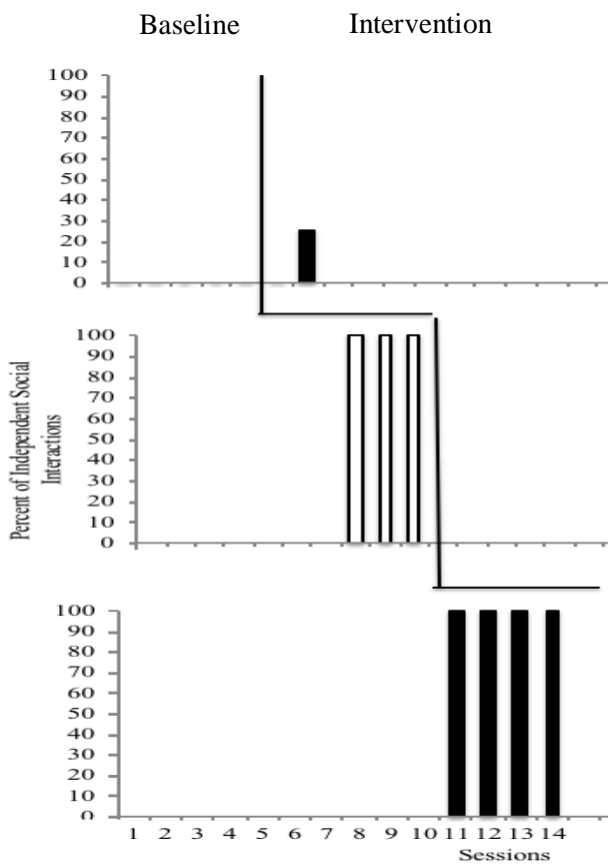


Figure 6. Percent of independent social interactions between Jordan and Travis. Shaded portions indicate interactions related to the character. Unshaded portions indicate interactions unrelated to the character presented.

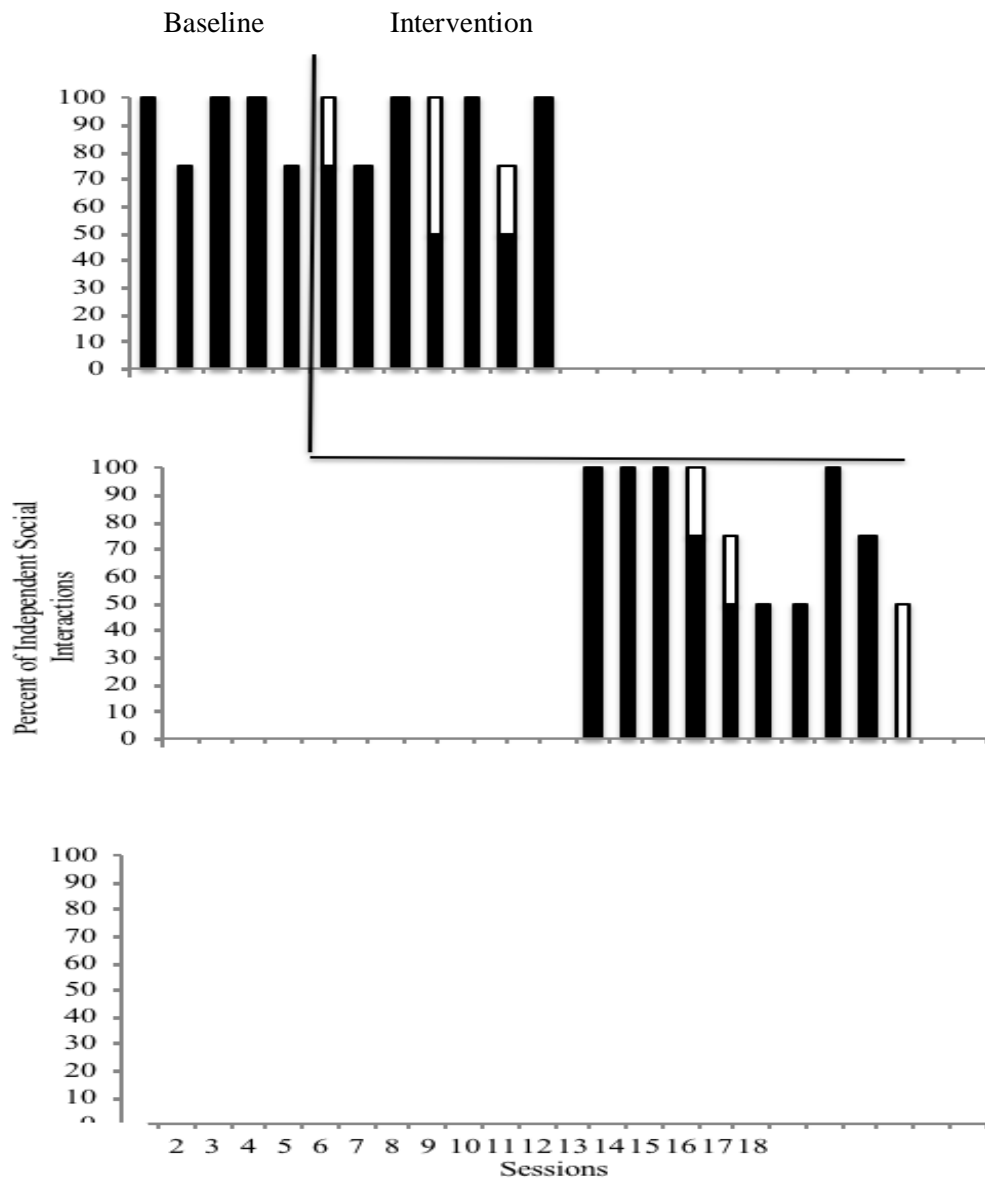


Figure 7. Percent of independent social interactions between Peter and Kayla. Shaded portions indicate interactions related to the character. Unshaded portions indicate interactions unrelated to the character presented.

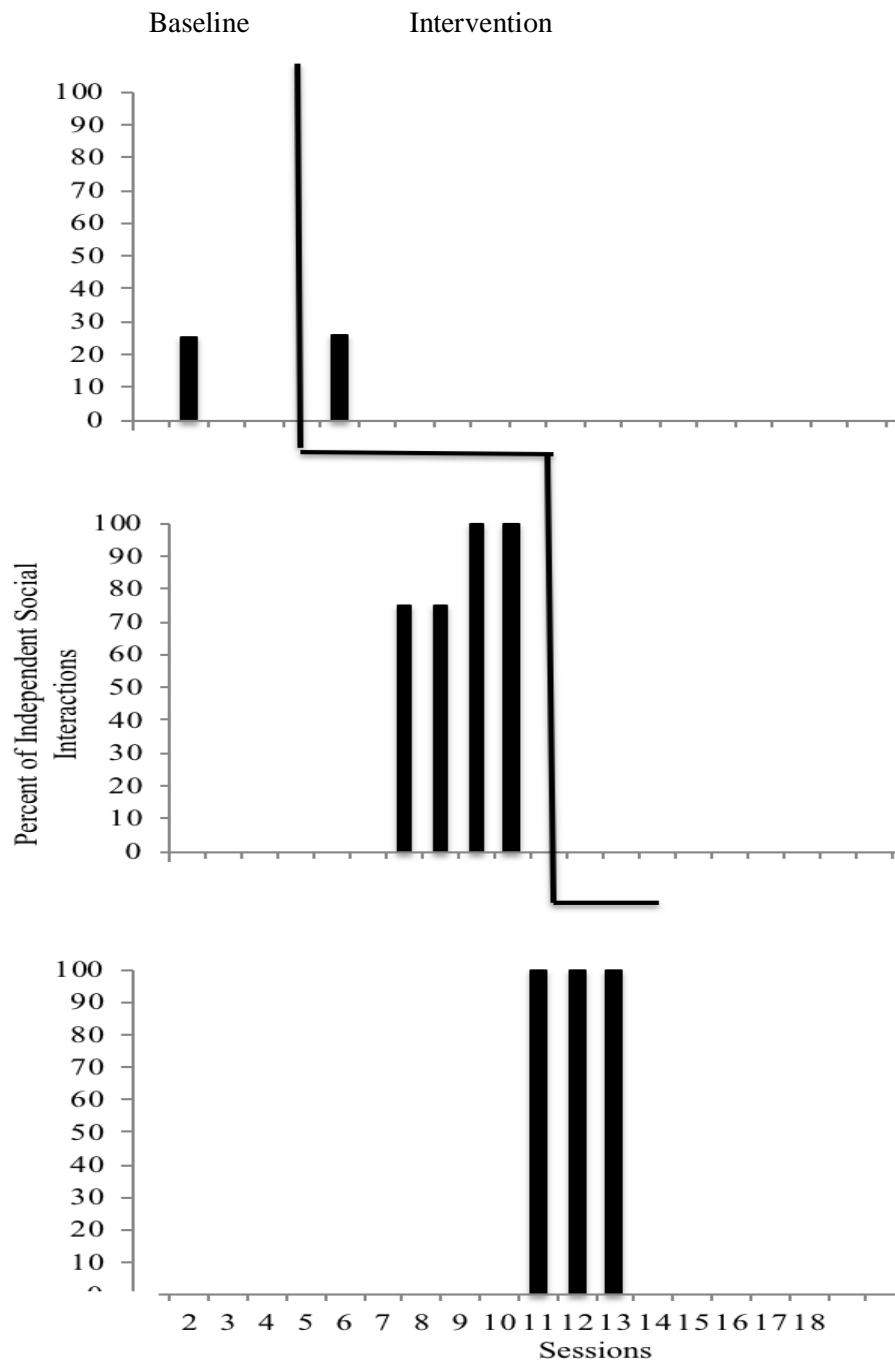


Figure 8. Percent of independent social interactions between Mason and Morgan. Shaded portions indicate interactions related to the character. Unshaded portions indicate interactions unrelated to the character presented.

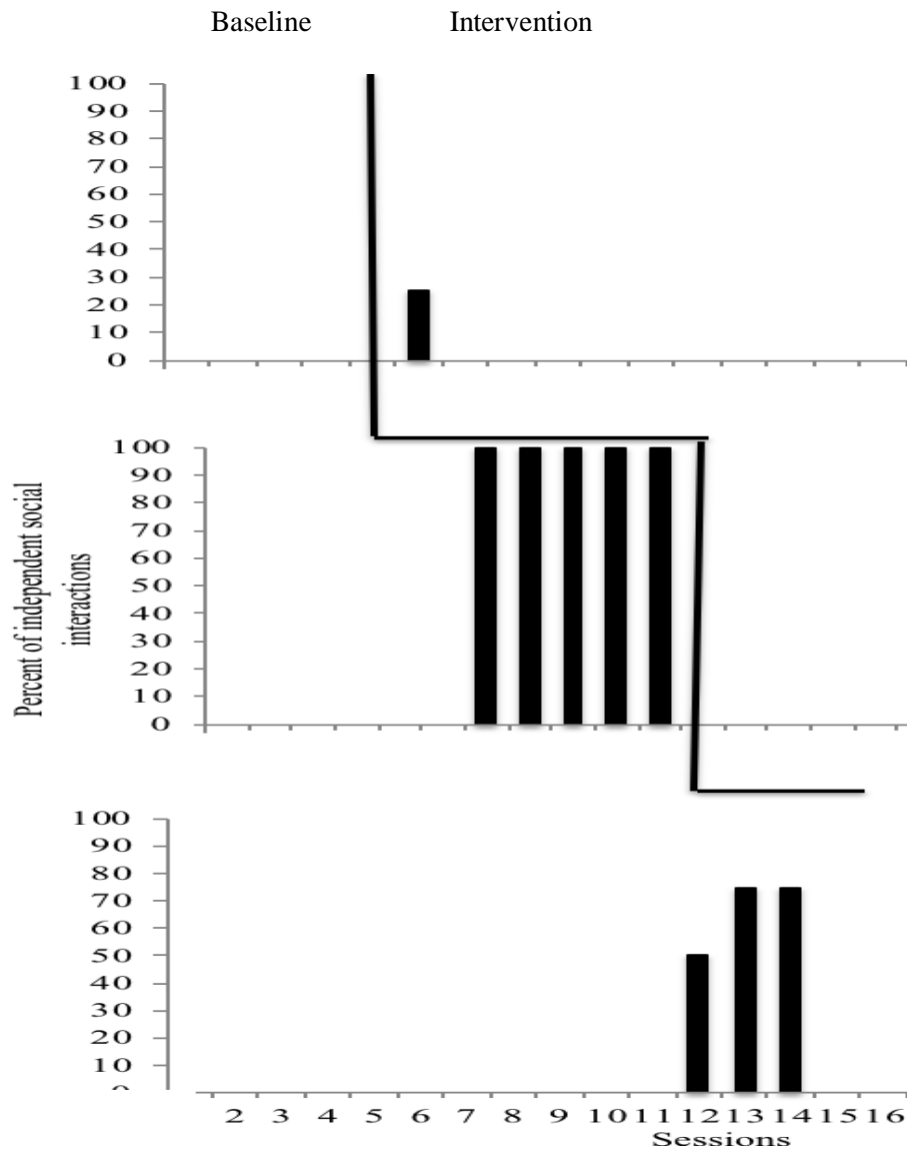


Figure 9. Percent of independent social interactions between Jen and Alex. Shaded portions indicate interactions related to the character. Unshaded portions indicate interactions unrelated to the character presented.

### Tutor Fidelity of Implementation

SWD and SWOD were able to implement procedures with a high degree of fidelity.



**SWOD training and instructional session fidelity.** During training sessions, Travis implemented the steps of the procedure with 100% reliability during his first attempt. Kayla did not positively reinforce after each trial during the first session; she completed the procedure with 100% reliability during the second session. Morgan did not provide the controlling prompt on multiple trials during the first session. She followed the steps of the procedure with 100% reliability during the second session. Alex implemented the procedure with 100% reliability after the first session.

**SWD training and instructional session fidelity.** During training sessions, Jordan was able to implement the procedures on the first session with 100% accuracy. Peter incorrectly praised for an incorrect response during the first training session; he was able to implement the procedure with 100% accuracy during the second training session. A modification was made for Jen and Mason after 3 sessions without reaching criterion. Jen and Mason were not able to provide the correct consequence based on correct, incorrect, or no response. The procedure was changed to pushing a button that provided the consequence. After the modification was made, Jen and Mason required two additional sessions to reach criterion.

During instructional sessions, Jordan was able to implement procedures with 100% fidelity across all instructional sessions, Peter was able to implement procedures with 100% fidelity, Jen was able to implement procedures with 94% fidelity, and Mason was able to implement procedures with 95% fidelity. Travis was able to implement procedures with 100% fidelity, Kayla with 98% fidelity, Alex with 100% fidelity and Morgan with 100% fidelity.

## **Section 5: Discussion**

The purpose of this study was to examine (a) if there was a functional relation between a peer tutor using technology and the SP procedure and acquisition of social studies vocabulary to a SWD, (b) if a peer without disabilities could learn from a SWD who provided instructional trails using technology, (c) if students with and without ASD could reliably implement instruction using technology, (d) would SWD learn target vocabulary being taught to the student without ASD through observational learning, and (e) would social interactions increase when a preferred character was embedded into the consequence, and if not, would SLP increase social initiations and response. Based on the data collected, all questions were answered.

First, the instruction delivered by SWOD and SWD using technology and the SP procedure was effective in teaching grade-level, social studies vocabulary. Four SWD were able to identify social studies vocabulary. Experimental control was strengthened by the replication of the independent variable (i.e., SP) across students because all four students' accuracy of response only increased once the independent variable was introduced. Four SWOD were able to identify social studies vocabulary after receiving instruction from SWD.

Second, SWOD and SWD were able to reliably implement instructional procedures using the technology and the SP procedure. After receiving training, eight students were able to access the PowerPoint app on the iPad and deliver the instruction following procedures correctly. Although some errors were made, all eight students remained above 80% on implementing procedures during instruction. This demonstrates

that SWD and SWOD can provide instruction using technology that allows them to share time learning from one another in the classroom.

The investigator took anecdotal notes during instructional sessions including notes on interrupted procedures. There were several occasions when teacher had to intervene during sessions. When students had their first instructional session with a peer, the teacher had to intervene to remind SWD that they were not to touch the iPad until it was their turn to teach. All instructional sessions had the peer deliver instruction first, followed by the SWD delivering instruction to the peer. On several occasions, the teacher had to intervene for technology issues and reset the presentation to the correct slide.

Third, observational learning data indicate that SWD learned some of the target stimuli they were teaching their peers through observational learning. The SWD learned grade level, social studies vocabulary through providing instructional trials to their peer.

Lastly, data were collected to determine whether embedding preferred characters into the training trials would promote social interactions between the SWD and their peer and if not would the SLP procedure prompt interactions to occur. Three out of four students did not have any social interactions with their peer when just the introduction of the character occurred. With additional prompts using the SLP procedure, all SWD had social interactions with their peers.

### **Implications for Practice**

Peers can help meet the needs of SWD by providing instruction using systematic instruction reliably. This would allow SWD to work with their peers during an instructional day. The study provided an additional demonstration that SWD can deliver instruction to SWOD after receiving training from their teacher on using the technology

programed by their teacher. This can help teachers by allowing students to provide one-on-one instruction to one another using evidence based procedures. This research demonstrated that SWD can deliver instruction with a high degree of fidelity when using technology. SWOD were able to learn grade level vocabulary from SWD showing that SWD can assume equitable roles in the classroom.

### **Limitations and Future Research**

This study had various practical limitations in the research including lack of access to the general education classroom to implement research. Limitations of the research include a lack of social validity data which could be collected after the study to determine if the SWOD and SWD enjoyed working together in the classroom. The research also did not test for generalization on the academic or social objectives targeted in the study.

Future research should include continued research assessing SWD serving in tutor roles to SWOD. This research could be conducted in other settings including the general education classroom. Research is also needed on whether SWOD can learn new material through providing instruction to SWD. Practitioners should also consider simplify the research by having all the students learn the same number of stimuli throughout the study.

Appendix A

Reliability Data Sheet-Training Sessions

Name: \_\_\_\_\_ Trainer: \_\_\_\_\_ Training Sessions: \_\_\_\_\_

Circle YES or NO according to what you observe in the training.

**Section 1 (Model)**

Teacher modeled the procedures to the student YES NO

Teacher modeled 3 possible student response possibilities

Teacher modeled appropriate consequence for all response types YES NO

**Section 2 (Lead)**

Students provided instruction to teacher YES NO

Teacher provided corrective feedback on errors YES NO

Students are lead through appropriate consequence for all response types YES NO

**Section 3 (Test)**

Teacher tests student implementation of procedures YES NO

Teacher praises student at end of session YES NO

Teacher provides feedback at end of session YES NO

---

Teacher Procedures % \_\_\_\_\_

Student (Test) Procedure % \_\_\_\_\_

## Appendix B

### Full Probe Data Sheet

Name: \_\_\_\_\_ Instructor: \_\_\_\_\_

Objective: \_\_\_\_\_ Response interval: \_\_\_\_\_

Stimuli	Date							
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
<b>%/# Correct</b>								

+ = Correct, - = Incorrect, 0 = No response

18 trials (9 stimuli x 2 trials each) Stimuli is rearranged daily on presentation

24 trials (12 stimuli x 2 trials each) Stimuli is rearranged daily on presentation

## Appendix C

### Simultaneous Prompting Data Sheet

Daily Probe, Intermittent Probe, Pretest/Posttest, Observational Learning

Name: \_\_\_\_\_ Instructor: \_\_\_\_\_ Response interval: \_\_\_\_\_

	Circle	Daily Probe	Daily Probe	Daily Probe	Daily Probe	Daily Probe	Daily Probe	Daily Probe
Tier _____		Int. Probe	Int. Probe	Int. Probe	Int. Probe	Int. Probe	Int. Probe	Int. Probe
Stimuli	Date							
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
<b>%/# NR</b>								
<b>%/# Errors</b>								
<b>%/# Correct</b>								

## Appendix D

### Data Sheet for Social Interactions & Procedural Fidelity/IOA

Session	Independent	Indirect Verbal	Model
Date	Interaction before NO SLP needed 1__2__3__4__  Procedural Fidelity- Check when behavior occurs	Teacher Waits 4s 1__2__3__4__  Teacher Provides IV prompt 1__2__3__4__	Teacher waited 4s 1__2__3__4__  Teacher Provides M prompt 1__2__3__4__
1			
2			
3			
4			
Total:			
Procedural Fidelity # observed/ total planned x 100		IOA # agreements / # agree + disagree x 100	

+ = Social Interaction Occurred    - = Social Interaction Did Not Occur

**Independent** = Social Interaction Occurred within 4 s of presentation of character

**IV** = After 4 s a social interaction did not occur, teacher provide IV prompt “you can talk to each other right now”

**Model** = After IV teacher waits another 4 s before providing prompt, “say, I love SpongeBob”



## Appendix E

### Procedural Fidelity and Interobserver Reliability

#### Full Probe, Intermittent Probe, Daily Probe

Student name: \_\_\_\_\_

Instructor: \_\_\_\_\_

Date: \_\_\_\_\_

Session #: \_\_\_\_\_

Instructional Materials Prepared: Yes No    Attentional Cue Prior to Session: Yes No

Trial	Stimulus	Swipes to show stimulus	Give Task Direction	Waits 3 s for student to respond	Student Response	Provide Correct Consequence	
						Praise for correct	No Comment/Moves on for Incorrect/NR
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							
17							
18							
Summary Data:							
<b>Procedural Fidelity</b>							
# observed/ total planned x 100							
<b>IOA</b>							
# agreements / # agree + disagree x 100							

Procedures + = Behavior Observed    - = Behavior not observed

Student Response + = Correct, - = Incorrect, 0 = No Response

## Appendix F

### Procedural Fidelity and Interobserver Reliability

#### Intervention Sessions

Student name: \_\_\_\_\_

Instructor: \_\_\_\_\_

Date: \_\_\_\_\_

Session #: \_\_\_\_\_

Instructional Materials Prepared: Yes No    Attentional Cue Prior to Session: Yes No

Trial	Stimulus	Swipes to show stimuli	Give task direction	Waits 0 s- provides controlling prompt	Student Response	Provide Correct Consequence	
						Praise for correct	Repeats task direction and provides controlling prompt
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
Summary Data:							
<b>Procedural Fidelity</b>							
# observed/ total planned x 100							
<b>IOA</b>							
# agreements / # agree + disagree x 100							

Procedures + = Behavior Observed    - = Behavior not observed

Student Response + = Correct, - = Incorrect, 0 = No Response

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**Vita**

Lindsey Graessle

University of Kentucky College 2007-2011  
Bachelor of Science in Education