THE EFFECTS OF BEHAVIOR SKILLS TRAINING ON ACQUISITION OF SELF-INSTRUCTIONAL SKILLS FOR ELEMENTARY STUDENTS WITH INTELLECTUAL DISABILITY

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THE EFFECTS OF BEHAVIOR SKILLS TRAINING ON ACQUISITION OF SELF-INSTRUCTIONAL SKILLS FOR ELEMENTARY STUDENTS WITH INTELLECTUAL DISABILITY

THESIS

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

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Lexington, Kentucky

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Lexington, Kentucky

2018

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ABSTRACT OF THESIS

THE EFFECTS OF BEHAVIOR SKILLS TRAINING ON ACQUISITION OF SELF-INSTRUCTIONAL SKILLS FOR ELEMENTARY STUDENTS WITH INTELLECTUAL DISABILITY

Research demonstrates that video modeling and visual activity schedules have been effective in teaching students with disabilities a variety of skills. However, the instructional procedures used to teach students to acquire the necessary skills to perform the tasks can take time for the students and the instructors. A behavior skills training package was investigated within a multiple probe design across students to determine if four elementary aged students with intellectual disability, with and without autism spectrum disorder, could acquire self-instructional skills. The dependent variables in the study were the effects of behavior skills training on the acquisition of self-instructional skills and the effects of video activity schedules on the acquisition of novel skills. The independent variable was behavior skills training. Three students were able to acquire the self-instructional skills in an effective and efficient manner using behavior skills training. After learning how to navigate the video activity schedules, three students were able to generalize and maintain the self-instructional skills to learn novel tasks. The results suggest that behavior skills training may be an effective instructional strategy for teaching self-instructional skills to students with intellectual disability.

KEYWORDS: Video activity schedules, self-instruction, behavior skills training, intellectual disability, autism spectrum disorder

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April 12, 2018
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Section 1: Introduction

It is often difficult for students with intellectual disability (ID), with or without autism spectrum disorder (ASD), to acquire new skills and generalize these skills across settings and environments (Collins, 2012). These individuals often rely on prompts or other adult supports in order to complete tasks that could be completed independently. Time delay, modeling, visual supports, and task-analysis have all been successful in teaching individuals with disabilities to acquire new skills and complete tasks more independently, but these practices often rely on adults to deliver the instruction (Wong et al., 2012). Over the recent years, research has demonstrated that visual supports such as visual activity schedules (VAS; Knight, Sartini, & Spriggs, 2015; Spriggs, Mims, van Dijk, & Knight, 2017) and video modeling (VM; Bellini, & Akullian, 2007) are effective strategies to use throughout various environments and situations for students with disabilities.

Visual schedules are used to break up multiple-step activities into single-step visual (e.g., picture, text) cues that are put in sequential order to help individuals complete tasks with increased independence. Research has demonstrated that visual schedules are effective for completing discrete tasks or chained activities, where the student knows what is expected or the teacher is there for guided support (Knight et al., 2015). Practitioners and researchers have used VAS to teach independent transitioning for those with ASD (e.g., Pierce, Spriggs, Gast, & Luscre, 2013). In addition to transitioning, VAS have also been used to increase on-task behaviors (e.g., Bryan & Gast, 2000), reduce problem behaviors (e.g., Waters, Lerman, & Hovanetz, 2009), and teach social skills (e.g., Krantz & McClannahan, 1998). For novel activities, adding VM to
VAS might allow students to complete activities without the assistance of an adult and serve as a self-instructional procedure.

The process of VM involves recording a target behavior in a way that it is able to be viewed consistently and as many times as needed in order to teach the behavior. Many typically developing individuals rely on technology to self-instruct by viewing online videos that imitate the skill that they want to learn. Video modeling displays each step of a chained behavior in order, demonstrating completion of the target behavior. With advances in recent technology, VM has become a method used to teach a variety of skills. Video modeling has been used to teach a wide range of skills to those with disabilities across environments including, but not limited to, functional skills (e.g., Shipley-Benamou, Lutzker, & Taubman, 2002), social skills (e.g., O’Handley, Radley, & Whipple, 2015), transitioning (e.g., Cihak, Fahrenkrog, Ayres, & Smith, 2010), and leisure activities (e.g., Blum-Dimaya, Reeve, Reeve, & Hoch, 2010). Recent technology makes it an easy and convenient teaching method for students to self-instruct.

Video modeling and VAS can be cost efficient and provide a consistent way to teach individuals self-instruction (SI) procedures. Self-instruction is a pivotal skill in that once an individual has mastered and generalized a SI procedure, he/she will be able to use that skill to learn additional skills without the assistance of an instructor (Koegel, Koegel, Harrower, & Carter, 1999). This will lead to greater independence in various life domains (e.g., self-care, leisure) because once an individual is taught to navigate a mobile device to find a video corresponding to a presented unknown task, for example, that individual will have a means of instruction without the need of an additional person, such as a teacher.
Embedding videos into VAS to create a video activity schedules (VidAS) on portable devices results in an age appropriate, discrete, socially acceptable, and easily available system for students to self-instruct new skills (Spriggs, Knight, & Sherrow, 2015). Currently, there is limited research done to evaluate the effectiveness of VidAS. Spriggs et al. (2015) investigated the use of VidAS via an iPad application (My Pictures Talk™) to teach four high school students with ASD to complete functional daily living skills independently. Each VidAS incorporated individualized videos into the VAS. Technology training took place prior to intervention using system of least prompts (SLP) to teach students to independently open and work the application on the iPad using tasks already familiar to students. The results showed that all students acquired the skills necessary to use the VidAS independently and to complete novel tasks. The researchers altered intervention to include VAS and video chunking (i.e., smaller amounts of steps shown at one time) for two students who were making limited progress with the VidAS that contained video models. After the implementation of video chunking, the two students acquired the targeted skills. Students generalized performance of the target skills when using only a static VAS to novel task exemplars after the removal of the embedded videos from the VAS. Shepley, Spriggs, Samudre, & Elliot (2017) replicated the Spriggs et al. study in order to add to the external validity of the VidAS SI strategy. The use of VidAS containing video prompts was investigated as the primary dependent variable to teach four middle school students to independently complete daily living skills. The researchers used SLP to teach students to navigate the VidAS. Findings showed that a SLP procedure was effective to teach SI behaviors, specifically initiating and navigating
technology, to complete known tasks. VidAS was an effective SI method to teach novel tasks for three of four students.

Currently, there is a gap in the literature demonstrating the effectiveness of videos embedded within VAS for students with ID at the elementary school level, as well as teaching these students SI procedures. Research shows that it is important for children to develop independence early in life in order to develop skills necessary to achieve a successful life (Shipley-Benamou et al., 2002). Students with ID require repeated instruction, often in the form of massed or distributed trials, in order to master and maintain skills (Collins, 2012). It is important to identify the most effective and efficient strategy to use with students. Using BST to teach SI procedures provides individuals the strategies required to seek needed information to acquire other tasks. It is critical to teach students the pivotal behavior of SI at an early age for students with ID. This allows students to acquire the skills and use them in everyday life in order to be more independent at an earlier age. Often times, students lean on adult support and prompts in order to complete tasks they could learn to do independently. By promoting independence and teaching students SI procedures early in their school careers, students learn to be less instructor dependent and begin to acquire tasks on their own using SI prompts. While curriculum for elementary students with ID focuses on academics, self-care, and social skills including appropriate recreation and leisure activities, focusing on teaching learners to teach themselves will lead to collateral learning as the student ages. Shipley-Benamou et al. (2002) demonstrated that children diagnosed with ASD as young as 5-years-old were able to acquire the skills necessary to complete a successive approximation or chain sequence in order to complete daily living skills (i.e., pet care,
making orange juice, table setting) using VM. It is important to teach children with ID self-instructional skills so that they are able to build on them in order to live a more independent lifestyle. Acquiring SI skills at an earlier age would help decrease the burden of parents and caregivers due to their decreased time and energy spent on caring for them, while giving the child more freedom and self-confidence (Shipley-Benamou et al., 2002). Students can use their acquired SI system to increase their vocational skills in order to be successful in other areas throughout their lives, especially in post-school environments.

In terms of implementation, the methods referenced above (i.e., SLP) were effective in reaching acquisition of SI behaviors. Yet, it took students up to 11 training sessions to learn the SI behaviors prior to the novel task being introduced. The literature supports using BST as an effective and efficient procedure. Behavior skills training has been used for training employees and staff (e.g., Belisle, Rowsey, & Dixon, 2016; Haffey & Levant, 1984; Sarokoff & Sturmey, 2004). Research supports BST; however, inquiries on its effectiveness and efficiency are limited for students with disabilities. Training loosely is a component of BST that systematic instruction does not have. Training loosely could lead to greater generalization outcomes for students with disabilities. Generalization will not occur without programming; therefore, it is important to plan for generalization in order for SI to become a pivotal skill (Stokes & Baer, 1977). Researchers have conducted a limited number of investigations that actively programmed for generalization using loose training procedures. This is important because if a learner is unable to generalize SI behaviors to a novel skill, then the skill is no longer functional and is of limited use to the learner (Stokes & Baer, 1977). However, in order maximize
instructional efforts at teaching students with ID, researchers should examine the utility of looser training procedures and its potential impact on acquisition of novel skills.

Behavior skills training involves four primary components that occur in quick succession: 1) brief (1-2 min) didactic explanation, 2) modeling, 3) role playing, and 4) performance feedback. Behavior skills training also ensures that learners are demonstrating the skill with proficiency before the training component is removed. Behavior skills training is different from current practice because it does not rely on teaching isolated skills but rather a process, leading to a generalizable skill for students to learn.

The purpose of this study was to extend the literature on using VidAS as a SI strategy for elementary aged students and to evaluate the effects of BST on the acquisition of SI procedures for students with ID. The proposed research is important for teachers, related service providers, and caregivers in the students’ life in order for students with disabilities to be more independent throughout their environments by learning SI procedures that have potential to be generalized across environments.
Section 2: Research Question

This study evaluated the effects of BST on the acquisition of the SI skills. The purpose of this research study was to answer the following questions:

(1) What are the effects of BST on the acquisition of SI skills for students with an ID, with and without ASD?

(2) Once the students acquire the training of using VidAS, what are the effects of VidAS on the acquisition of novel skills for elementary school students with ID, with and without ASD?
Section 3: Methods

Students

Four students who attended an urban elementary school participated in the study (two females and two males). The students ranged in age from 9 to 11 years old and all had a diagnosis of ID, with and without ASD. Prior to the study, all students were familiar with using static picture VAS to complete daily tasks, such as assignments, classroom jobs, and handwashing. The VAS were used throughout the day and were portable and individualized for the students. All students were dependent on adult prompts to complete daily tasks, even though each student had the skill set and materials necessary to complete the VAS tasks (e.g. assignments, handwashing, and classroom jobs) independently. All students were ambulatory and could independently access familiar environments and technology, but they each experienced difficulty with independent transitions between activities (e.g., needed adult support to successfully transition).

Martha was an 11–year-old Caucasian female who had an ID. Martha communicated using vocal speech, but she had social and communication deficits. She had an IQ score of 55 according to the Kaufman Assessment Battery for Children-Second Edition (KABC-II; Kaufman & Kaufman, 2004) and an adaptive score of 77 according to the Adaptive Behavior Inventory-Short Form (Brown & Leigh, 1986). She primarily participated within the general education setting and received special education services for Language Arts and Math. She read on a third grade reading level. She was working on her writing skills by developing 3-5 sentences and using appropriate capitalization and
punctuation in her writing. In math, Martha was working on identifying the correct operation in word problems and solving the problem.

Zach was a 9-year-old African-American male diagnosed with ASD. Zach scored 40.5 on the Childhood Autism Rating Scale-Second Edition (CARS2-ST; Schopler, Van Bourgondien, Wellman, & Love, 2010) indicating that he displayed severe symptoms of ASD. He had an IQ score of 42 according to the Stanford Binet Intelligence Scales (SB-5, Roid, 2003) and an overall adaptive composite score of 59 on the Vineland Adaptive Behavior Scales-Third Edition (VABS-3; Sparrow, Cicchetti, & Saulnier, 2016). He communicated primarily through gestures, word approximations and his iPad equipped with Proloquo2Go™. At the time of the study, Zach was working on identifying letters and letter sounds, writing letters, numbers, and typing his name, identifying and counting numbers to 10, and identifying safety signs. Zach was able to complete independent work for up to 30 min, but needed prompting to stay on task.

Peter was an 11-year-old Caucasian male diagnosed with ASD. According to recent evaluation results, he scored a 30 on the CARS2-ST (Schopler et al., 2010) which indicated mild to moderate symptoms of ASD. He had an IQ score of 53 according to the SB-5 (Roid, 2003) and an overall adaptive composite score of 71 on the VABS-3 (Sparrow et al., 2016). He communicated using vocal speech but had social and communication deficits. He was able to read fluently on a second grade reading level. He was able to answer basic comprehension questions but answered higher level questions with better accuracy when he went back and highlighted key parts of the text. At the time of the study, he was working on reading fluency, increasing reading comprehension,
organizing his writing, typing, counting out change, and solving real-life mathematical word problems dealing with money and time.

Ashley was a 9-year-old African-American female diagnosed with an ID and Hearing Impairment. She wore hearing aids daily. She had an IQ score of 40 according to the KABC-II (Kaufman & Kaufman, 2004) nonverbal index. Ashley received an overall adaptive composite score of 55 on the VABS-3 (Sparrow et al., 2016). Ashley communicated primarily through word approximations, basic sign language, and using her iPad equipped with Proloquo2Go™. She was working on identifying functional sight words, typing sight words, writing her name, letters, and numbers, identifying and counting numbers to 10, using a calculator, and completing a work system within a specified amount of time with minimal prompting.

**Selection Criteria.** Students were screened prior to selection for the study to ensure they met all inclusion criteria. Selection criteria for students to participate in the study included: (a) elementary aged student between the ages of 5 to 11 years old; (b) had an Individualized Education Plan; (c) had an ID; (d) demonstrated fine and gross motor skills necessary to navigate mobile technology and complete all tasks; (e) demonstrated the ability to attend to a task for the duration of the tasks selected (e.g., up to 2 min); (f) demonstrated the ability to imitate a VM for the specified number of steps needed to complete the tasks (e.g., 2-4 steps); (g) demonstrated adequate visual acuity to discriminate icons on a screen (approximately 1.5 cm by 1.5 cm) and sufficient hearing with or without hearing aids; (h) had no prior means of self-instruction; and (i) had parental consent and participant assent to participate in the study.
**Instructional Setting**

The study took place in an elementary school resource classroom for students with ID within an urban school district in a southeastern state. The school had approximately 700 students. Baseline, BST, and VidAS intervention sessions were conducted within the resource classroom setting. There was a teacher and four para educators that were in and out of the room throughout the day.

The classroom was arranged with two group tables, individual student desks, and an individual work area. The classroom was equipped with a kitchen area and a swing for occupational therapy purposes. There was also a carpet area, which allowed for a break and seating change for students who used wheelchairs, along with a desktop computer, Chromebooks, and iPads at a table for instructional purposes. The sessions started at the group table in the back of the classroom in a one-on-one arrangement. A divider was placed between the back table and the rest of the classroom to eliminate distractions for the participant and the other students.

**Materials/Equipment**

**iPad.** Three classroom iPads (iPad Air 2 running iOS 10.3) were equipped with *My Pictures Talk™*, the same application used in Spriggs et al. (2015) and Shepley et al. (2017). When students opened the application, a single VAS title and corresponding picture displayed on the screen (e.g., Dance Schedule or Block Schedule). Once activated, each VAS included three pictures and titles of tasks appeared in sequential order top to bottom (e.g., sprinkler, salsa, thriller). Each picture in the VAS linked to a VM of the corresponding task that was activated by touching the picture (Appendix A).
Videos. Videos for baseline, BST, and VidAS conditions were filmed using an iPhone and distributed on each of the iPads for randomization. The videos were loaded and stored within the My Pictures Talk™ application. BST videos were filmed in first person perspective capturing the hands of the teacher building the blocks. The teacher narrated each step of the block task analysis in the video. Baseline and VidAS videos were filmed from third person perspective to depict each dance move. The actor was a student teacher in the classroom at the time of the study who narrated each step of every dance move for the videos. Behavior skills training videos ranged in duration from 11 s to 19 s and VidAS videos ranged in duration from 8 s to 16 s. VidAS videos were edited to include a 1 s clip of the first step in each dance move without audio to serve as the baseline videos. This was done in order for the student to be able to press the picture and activate a video, but not to expose them to the dance move during baseline sessions. This was done in order to assess navigation during baseline.

Training Tasks. During technology training sessions, 19 Mega Bloks® were available for task completion. Five different block structures were randomized using random.org for each student, each session. This ensured the block structures varied and used equal amounts. Behavior skills training tasks (Table 1) were randomized using random.org and then put on an iPad in that order (Haahr, n.d.).

Target Tasks. During baseline and VidAS sessions, there were three possible dance schedules all with three different dance moves on each schedule. Each dance schedule was placed on a different iPad (Table 2). The iPads were numbered and put in a randomizer (random.org) to determine which iPad would be used in each session for each student. This ensured that each schedule was used equal amounts of time and varied.
Table 1: BST Block Task Analysis.

<table>
<thead>
<tr>
<th>Block Structure</th>
<th>Task Analysis</th>
</tr>
</thead>
</table>
| 1               | 1. Put the yellow block on the bottom  
|                 | 2. Stack the blue two-knob block on top of the yellow two-knob block  
|                 | 3. Stack the green two-knob block on top |
| 2               | 1. Put two blue four-knob blocks beside each other  
|                 | 2. Stack one green two-knob block in the back  
|                 | 3. Stack one green two-knob block in the front |
| 3               | 1. Put one blue four-knob block on the bottom  
|                 | 2. Put green two-knob block on one side knob of the blue four-knob block  
|                 | 3. Put the other green two-knob block on the other side knob of the blue four-knob block  
|                 | 4. Put the other blue four-knob block in the middle |
| 4               | 1. Put the blue four-knob block on the bottom  
|                 | 2. Stack the yellow four-knob block on top  
|                 | 3. Put the red three-knob block on 3 of the 4 knobs on the yellow block  
|                 | 4. Put the blue one knob block on one of the 4 knobs of the yellow block |
| 5               | 1. Put the red block on the bottom  
|                 | 2. Put the blue square four-knob block on top of the other red square four-knob block  
|                 | 3. Stack the two-knob yellow block on top  
|                 | 4. Stack the blue two-knob block on top of the yellow two-knob block |
Table 2: Dance Task Analysis.

<table>
<thead>
<tr>
<th></th>
<th>iPad 1</th>
<th>iPad 2</th>
<th>iPad 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sprinkler</td>
<td>1. Put hand up near head</td>
<td>Running</td>
<td>Charlie</td>
</tr>
<tr>
<td></td>
<td>2. Move other hand up-</td>
<td>Man</td>
<td>Brown</td>
</tr>
<tr>
<td></td>
<td>above belly button</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3. Move that hand across body</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Salsa</td>
<td>1. Step forward with one foot</td>
<td>Disco</td>
<td>V-Step</td>
</tr>
<tr>
<td></td>
<td>2. Put both feet together</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3. Step back with the other foot</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>4. Put both feet together</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thriller</td>
<td>1. Move hands up toward chest</td>
<td>Lawn</td>
<td>Hand</td>
</tr>
<tr>
<td></td>
<td>2. Move hands toward one side of body</td>
<td>Mower</td>
<td>Jive</td>
</tr>
<tr>
<td></td>
<td>3. Move hands toward other side of body</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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Additional Materials. When collecting data, a writing utensil and data collection sheet were needed. The two separate iPads equipped with *Proloquo2Go™* for Zach and Ashley were present for each session. Zach and Ashley also earned tokens on an intermittent reinforcement schedule throughout the school day, including study sessions.

Experimental Design

A single-case multiple probe research design across students (Ledford & Gast, 2018) was used to evaluate if a functional relation existed between BST on the acquisition of SI skills and increased independence within and between novel chained tasks. This design allowed for practical application of the study in the classroom. Experimental control was demonstrated by replicating the effects of the intervention across students using a time-lagged introduction of the intervention to show at least three demonstrations of effect at three different points in time. Data were collected until students met mastery criterion in BST training and VidAS conditions. A minimum of seven data points were collected in baseline or until a stable baseline trend was observed. The multiple probe design allowed for intermittent probes to be collected at different points in time for each student. BST training was introduced to one student at a time after a stable baseline pattern was observed. After mastery in BST, VidAS began for that student. This design protects against threats to internal validity by limiting testing effects by not overly exposing students to the material. This experimental design was used in order to increase the external validity of the Shepley et al. (2017) findings, as well as add to the research for BST procedures.
Data Collection

The dependent variables in the study were the percentage of steps navigated independently using the technology to SI and the percentage of steps completed independently for the three tasks in the task analysis within the VidAS. Data were collected across baseline, BST training, and VidAS sessions. For baseline and BST sessions, the data represented the total number of task steps completed correctly throughout all the tasks completed in the session, along with the navigation steps to complete all tasks independently. This was calculated by adding up the total number of correct responses divided by the total number of steps multiplied by 100.

For VidAS sessions, the researcher collected data for navigation steps by adding the total number of correct navigation steps and dividing by the total number of navigation steps possible through the first error on task steps and multiplied by 100. Data were collected on the dance task steps by reporting the percentage of correct task completion of the total task. This was done by adding the total number of dance task steps completed independently and dividing by the total number of steps in the task and multiplied by 100.

Each student was given a 5 s interval to initiate the response and a 5 s interval to complete that step in the task analysis. Task steps could be completed in any order, as long as the final product was not altered. A correct response occurred when the student initiated the step within 5 s of the task direction, after viewing the video prompt, or following the completion of the previous step, and correctly completed the step within 5 s. For correct responses, a plus (+) was recorded. An error occurred when the student did not initiate a response within 5 s, complete the step within 5 s, or preformed the step
incorrectly, altering the desired end product. For incorrect responses, a minus (-) was recorded.

**Procedures**

**General procedures.** Sessions were conducted two to five days a week until all students reached mastery. Sessions were conducted up to two times a day in the students’ resource room, first thing in the morning or during the teacher's planning period. There was a minimum of 1 hr between each session if more than one was conducted in a day. The iPads were loaded with the VidAS and all materials were arranged beforehand and available for each session. The correct iPad was located in the charging station at the start of all sessions, near the back of the classroom. Only the correct iPad was located in the charging station prior to each session. The teacher began each session by giving the students the task direction “check your block schedule” (BST) or "check your dance schedule" (baseline and VidAS). Students were given 5 s to initiate the first step in the task analysis and 5 s to complete each step. All correct responses for navigation and task received praise on a minimum VR-3 schedule of reinforcement, in which the average of every third correct responses received teacher praise, and the last step of each individual task was praised if performed correctly. Zach and Ashley earned tokens throughout sessions on their chart on an intermittent schedule of reinforcement and at the conclusion of each session. Martha and Peter received verbal praise throughout the sessions and at the conclusion of each session.

**Screening.** Prior to the start of the study, students were screened to ensure they were able to imitate a video model doing simple, arbitrary tasks (e.g., basic color sorting and gross motor movements) in a one-on-one setting. Prior to baseline, students were
screened on the modified moves from 16 dances to determine prior exposure to dance moves (see Appendix B).

Baseline. Baseline procedures followed general procedures. The baseline session served to assess student performance on navigation of technology and novel dance tasks. Baseline determined what percentage of task and navigation steps the student could complete independently prior to learning the SI procedures. During baseline sessions, the iPads were randomized for each student and the correct iPad was placed in the charging station prior to the start of each session. Each iPad included a 1 s video clip of the dance move to assess navigation. Baseline sessions were conducted in a one-on-one setting using multiple and single opportunity probes (SOP) for the use of VidAS to navigate and complete tasks. The first and every subsequent sixth sessions of baseline used a multiple opportunity probe (Cooper et al., 2007) to assess baseline performance on research question one. The researcher used SOP to assess research question two. However, dance task errors did not end the session. An error in the SOP ended the data collection for that dance move and if in a multiple opportunity probe session for research question one, the researched allowed the student to attempt the next navigation step in the task analysis. For multiple opportunity probes, following the task direction, the teacher allowed 5 s to initiate and 5 s to complete each step. If the student performed a step correctly, that step was scored as correct, and he or she was provided the same latency and duration for the subsequent steps. If a student did not initiate within 5 s or engaged in an error within the 5 s duration, the step was scored as incorrect, the teacher blocked the students view, the teacher completed the step out of sight of the student, and then told the student to “keep going”. This pattern continued through all steps within the task analysis. The student was
praised for working at the conclusion of the session. All other baseline sessions used SOP (Cooper et al., 2007). For SOP sessions, the teacher immediately stopped the session and gave the student general praise after the first critical error (i.e., one that altered the end product of the target task) that was made in the task analysis and the session was ended. No adult prompts were given other than the initial task direction (e.g. "Check your dance schedule."). Baseline sessions were conducted for all students for a minimum of seven consecutive sessions or until data stabilized or displayed a contratherapeutic trend for each student prior to moving on to the BST training phase. Intermittent probes were collected across all students not in intervention at least every seventh session and before each student and prior to BST or VidAS conditions.

**BST Training.** Though similar to the Shepley (2017) study, the technology training procedure was distinctive. While Shepley used SLP, BST was used to teach each student SI procedures using the iPad application and the VidAS appropriately. One student began BST training at a time. Behavior skills training was conducted one-on-one with the student and teacher. BST training was conducted using block assembly schedules which each consisted of three block creations. The researchers chose blocks in order to create an arbitrary task that was unpredictable to students in order for them to rely on the technology to learn self-instructional skills. All students had the fine motor ability to build with the blocks and prior history playing with the blocks. A total of five Mega Bloks® creations were possible in the schedule of three tasks. The tasks were randomly rotated using a randomizer. The content of the training included information on established procedures for teaching students SI prompting procedures (e.g., teacher made using *My Pictures Talk™* application on mobile device). A BST package was used
during technology training to teach student SI procedures. The students received 1) brief didactic explanation, 2) modeling, 3) role playing, and 4) performance feedback, all of which occurred with quick succession. During BST, data were collected on both navigation and tasks steps. Data were collected on the number of rehearsals for each student to reach criterion. There were multiple rehearsal trials within each rehearsal session. The rehearsal session included the didactic explanation, modeling, rehearsal trials, and performance feedback. Rehearsal trials and performance feedback were conducted repeatedly until the student reached mastery or 30 minutes had passed.

**Brief didactic explanation.** First, the students received oral, written, and visual instructions on the navigation steps required to self-instruct using the VidAS. A Chromebook displayed the instructions via a PowerPoint (Appendix C). The teacher read the instructions and navigated through the PowerPoint while the student listened.

**Modeling.** Next, the teacher then modeled how to complete the target behaviors in their entirety. For example, the teacher modeled how to retrieve the iPad, turn it on, select the *MyPics* application, etc. The teacher used a variety of language throughout each session.

**Role playing.** Following the *in vivo* model, the student had the opportunity to rehearse the target behaviors. For the training sessions, the student was given a different task in the rehearsal, rather than the one modeled in the model session, to ensure the need to self-instruct and use of the technology. The rehearsal allowed for the learner to demonstrate what they acquired from the instructions and model, while also giving the teacher the opportunity to assess the learner’s knowledge. The rehearsal trials followed SOP procedures using the training tasks. If a student made a navigation error during the
role playing phase, the student was stopped and the rehearsal trial was ended. Task errors
did not end the rehearsal session. The remaining steps, for both navigation and task steps,
were scored as incorrect. The teacher immediately provided performance feedback and
counted the rehearsal trial on the data collection sheet.

**Performance feedback.** When the rehearsal trial ended, either by participant
error or by the completion of the navigation behaviors, the teacher provided feedback to
the student. The feedback included both praise for correct SI behaviors and task
completion and correction contingent on the first navigation error, if occurred. The
feedback varied after each trial. After the teacher provided verbal feedback, the teacher
provided a model and then a new rehearsal trial began, following the BST package.

The teacher ensured that the learners were demonstrating the SI behaviors with
proficiency before the training component was removed. Mastery criterion for these
sessions was 100% correct for navigation steps and 90% correct for task completion
across two rehearsal sessions. Sessions ended if the student did not reached mastery
criterion within 30 min. Mastery criterion for the BST condition was three sessions at
mastery with at least two consecutive sessions in order to move on the VidAS condition.
The criterion was set in order to ensure that the learners were demonstrating the SI
behaviors with proficiency before the training component was removed. The total number
of sessions, total duration, and the mean duration per session in BST training were
recorded for each student. Data sheets were used to assess the students acquisition of
targeted behaviors, student fidelity of SI behaviors, and fidelity of BST implementation.
After the first student met criterion for BST training, that student began the VidAS
condition and all other students were probed in the baseline condition. BST training then began for the second student, if baseline levels remained stable.

**VidAS.** After reaching criterion in BST training, students began VidAS sessions with the dance schedules. Video activity schedule sessions were conducted in a one-on-one format using SOP following general procedures. Data were collected on navigation and task steps. Sessions ended when the student made an error on a task step. Navigation errors did not end the session. Mastery criterion for VidAS sessions were 100% correct on novel tasks for three sessions for at least two consecutive sessions. Students not involved in intervention were not in view of instruction to ensure that observational learning did not occur.

**Reliability**

Inter-observer agreement (IOA) and procedural fidelity data were collected throughout the study to control threats to internal validity. Both IOA and procedural fidelity were collected by graduate students trained in data collection at least 20% of sessions and a minimum of once in each condition across students. Inter-observer agreement was collected by comparing the data from the observer (*Appendix D*) and the data collector using a point-by-point method. For all responses that were the same, a (+) was assigned. For all responses that differed, a (-) was assigned. IOA was measured by adding up all the number of agreements (+) divided by the number agreements (+) plus the number of disagreements (-) multiplied by 100. Inter-observer agreement at 80% was considered acceptable reliability although 90% was desired (Ledford & Gast, 2018). If IOA data fell below 80%, the reliability data collector and the teacher met to retrain.
Procedural fidelity was measured to ensure the accuracy of which the independent variable was implemented. Graduate students trained in fidelity data collection used a checklist of planned behaviors to assess teacher behaviors (*Appendix C*). A + represented all planned completed behaviors and a – represented all incomplete planned behaviors. Procedural fidelity was measured by the number of teacher behaviors observed divided by the number of teacher behaviors planned multiplied by 100. Procedural fidelity at 80% was considered acceptable reliability although 90% was desired (Ledford & Gast, 2014). If procedural fidelity data fell below 80%, the fidelity data collector and the teacher met to retrain.

Inter-observer agreement data were collected for 52% of all sessions across conditions and students and was calculated at 99.7% agreement (range 91%-100%). Procedural reliability data were collected simultaneously with IOA data and was calculated at 99.9% (range 99-100%) indicating procedures for all conditions were implemented as planned.
Section 4: Results

Effectiveness of BST

Three of the four students mastered BST technology training acquiring the steps necessary to use the VidAS independently to complete novel tasks. Table 3 shows the number of sessions it took each student to master BST, along with the total duration and mean duration per session in BST. It took an average of seven sessions and 1 hr 10 min 40 s for the three students that mastered technology training using BST. Ashley was unable to make consistent progress with the BST procedure and did not master technology training using BST. Ashley was in BST for 14 sessions and 7 hrs prior to entering SLP.
Table 3: BST Data. *Denotes that the student did not master technology training using BST.

<table>
<thead>
<tr>
<th>Students</th>
<th>Number of Sessions</th>
<th>Duration of BST</th>
<th>Mean Duration Per Session</th>
</tr>
</thead>
<tbody>
<tr>
<td>Martha</td>
<td>4</td>
<td>19 min 27s</td>
<td>4 min 51 s</td>
</tr>
<tr>
<td>Zach</td>
<td>12</td>
<td>2 hrs 30 min 42 s</td>
<td>12 min 33 s</td>
</tr>
<tr>
<td>Peter</td>
<td>6</td>
<td>41 min 52 s</td>
<td>6 min 58 s</td>
</tr>
<tr>
<td>Ashley*</td>
<td>14*</td>
<td>7 hrs*</td>
<td>30 min*</td>
</tr>
</tbody>
</table>
Effectiveness of SLP

Ashely's inconsistent progress with BST across both navigation and skill data indicated that the intervention needed to be modified. Once SLP was introduced, there was an immediate and consistent change in level for navigation data. Task data showed a therapeutic accelerating trend. Ashley was in SLP for 42 sessions and 1 hr 48 min 37 s.

Effectiveness of VidAS

Effectiveness data were based on the students’ ability to complete three novel tasks after mastering BST. Those data are illustrated in Figure 1 as closed circles. The bars in Figure 1 illustrate student SI behaviors, which included initiating and using the technology, navigating to the correct VidAS, playing the video, and transitioning between activities (Table 4).
### Table 4: Navigation Task Analysis.

<table>
<thead>
<tr>
<th>Step</th>
<th>Step Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Get iPad from charging station</td>
</tr>
<tr>
<td>2</td>
<td>Press home button</td>
</tr>
<tr>
<td>3</td>
<td>Press home button again to unlock</td>
</tr>
<tr>
<td>4</td>
<td>Press the <em>MyPics</em> app on the iPad</td>
</tr>
<tr>
<td>5</td>
<td>Press the 'XXX' story on the iPad</td>
</tr>
<tr>
<td>6</td>
<td>Press the first picture at the top on the iPad</td>
</tr>
<tr>
<td>7</td>
<td>Press the picture to play the video on the iPad</td>
</tr>
<tr>
<td>8</td>
<td>Watch the video of the task</td>
</tr>
<tr>
<td>9</td>
<td>Press the green arrow on the right on the iPad</td>
</tr>
<tr>
<td>10</td>
<td>Press the picture to play the video on the iPad</td>
</tr>
<tr>
<td>11</td>
<td>Watch the video of the task</td>
</tr>
<tr>
<td>12</td>
<td>Press the green arrow on the right on the iPad</td>
</tr>
<tr>
<td>13</td>
<td>Press the picture to play the video on the iPad</td>
</tr>
<tr>
<td>14</td>
<td>Watch the video of the task</td>
</tr>
</tbody>
</table>
Martha completed 0% of steps of navigation and task correct for 7 consecutive baseline sessions which displayed a zero-CELERATING trend. Upon introduction of VidAS after BST mastery, her navigation and task data remained unchanged at zero-LEVELS for 6 sessions. She turned around when the task direction was given for the first three sessions of VidAS. A gestural prompt was added and paired with the task direction (e.g., "go check your dance schedule" and pointed to the iPad) during session 15. The trend of Martha's navigation data began accelerating, but she was not imitating the embedded video models, so her task data was zero-CELERATING. A verbal prompt (e.g. "do the dance move like in the video") was added to session 18 following the VM of the first task. Martha's task data began accelerating in a therapeutic direction, with mastery after 14 sessions.

Zach completed nine sessions of baseline and displayed a zero-CELERATING trend for both navigation of the technology and task. Upon introduction of VidAS after mastery in BST, his task data remained unchanged at zero-LEVELS for 3 sessions. His navigation data showed an immediate and abrupt change in level. A procedural modification was made and a verbal prompt (e.g. "you do it") was added to session 28 following the VM. The verbal prompt was added to consecutive sessions when there was no response within 5 s after the VM. A variable trend in a therapeutic direction was observed in the task data. It took Zack 16 sessions to reach mastery.

Peter completed 0% steps correct for both navigation and task data for 11 sessions of baseline. Upon introduction of VidAS after BST, his data displayed an immediate and abrupt change in level to 100% for both navigation and task completion data. He reached mastery in 3 sessions.
Ashley did not enter VidAS due to time.

**Maintenance Data**

Maintenance data were taken approximately once a month after mastery of VidAS. Martha, Zach, and Peter maintained the skill to navigate the VidAS to self-instruct and complete the dance task. Martha, Zach, and Peter maintained the skill across time for both navigation and task completion.
Figure 1: Graph of Results. Shaded bars represent navigation performance. Circles represent task performance.
Section 5: Discussion

The purpose of the study was to evaluate the effects of BST in teaching self-instructional skills for elementary aged students and to contribute to and extend the literature on using BST to teach students with ID. Findings demonstrated BST was an effective instructional method for teaching three students how to self-instruct in order to navigate the VidAS. After acquiring the skills to self-instruct in order to navigate the VidAS, three students were able to generalize and maintain the SI skills to learn novel tasks. Overall, there was a functional relation for BST to teach self-instructional behaviors. VidAS increased independence with the dance moves.

The results of the current study provide support for VidAS as a tool for SI for individuals with ID. This research expands the literature in several ways. It added external validity for the use BST to acquire self-instructional skills. The study also used arbitrary and unpredictable training tasks instead of known tasks during BST, as suggested in Shepley et al. (2017), to teach students to navigate the VidAS. This ensured that the students self-instructed and relied on the technology to proceed through every step in the task analysis to complete both the tasks and the navigation. This study used BST to teach technology use which was hypothesized to be a more efficient method to acquire the navigation of the VidAS. It required 4 to 12 sessions and an average of 1 hr 10 min 40 s for three students to master BST. It could be a more efficient method to teach students to navigate technology; however, more research is needed to establish the most efficient method for technology training. This is a similar finding to Shepley et al. (2017). It took students between 5 and 11 sessions to reach mastery during technology training.
when using a more systematic method of SLP. This demonstrated to be an effective and efficient method for the students based on prior learning history.

Behavior skills training serves as a looser training component and not as ridged as other training methods (e.g. SLP) which could allow programing for generalization. Students with ID have difficulty generalizing, so teaching self-instructional methods in a looser (Stokes & Baer, 1977) way could be beneficial when learning novel skills. The components of BST occur in quick succession and could be easily adopted for those not specifically trained in special education (e.g. paraeducators and parents) (Haffey & Levant, 1984). Behavior skills training can be taught quickly and effectively and can be used as a training package to teach specific skills (Sarokoff & Sturmey, 2004). Behavior skills training also has some limitations. It is not as systematic as other methods and may not be fit for every student. This study was able to show three demonstrations of effect at three different points in time which demonstrates that some elementary students can acquire SI behavior. This could lead to more independence in the future for these students. They may not have to depend on adults to learn novel skills, but rather SI to learn them themselves. This can lead to more inclusive opportunities with their peers and could lead to more self-confidence in these individuals.

Limitations and Future Research

Behavior skills training was not effective for one student in the current study. Behavior skills training serves as a looser training method meaning there is not a set way to implement the training procedures, which could lead to greater generalization outcomes. Some students need more of a systematic method, such as SLP. Using a more systematic method leaves less room for confusion for learners. During BST sessions,
Ashley would become frustrated by vocalizing and pushing the iPad and blocks away after repeated trials. This could indicate she did not know what was expected and needed instruction that is more systematic. Even using SLP to teach SI behaviors, it took the student 42 sessions to move on the VidAS. After introduction to SLP, her task errors were due to specific task steps (e.g., putting the block on two knobs instead of one). This could have been predetermined if the screening tasks more closely matched the tasks in the study. The screening tasks were not as specific as the tasks in the study. Her previous learning history suggests that it takes her more time and exposure in order to reach mastery when compared to other students in the study. Future studies should examine for what group of students with ID BST would be effective. It is still critical for her to acquire SI skills in order to continue to learn in the absence of an instructor. Therefore, when teaching SI it is critical to program for generalization and assess maintenance.

When using systematic instruction, one can program for generalization by programming common stimuli in order to control generalization (Stokes & Baer, 1977). Future research should focus on programming for generalization by programming common stimuli for students that need more of a systematical instruction approach to learning. Generalization with other novel skills were not assessed during the study. Students were assessed on maintaining SI skills with the same tasks. Future research should focus on programing for generalization of SI behaviors with novel tasks.

Another limitation to the study was that a verbal prompt had to be added in order for two students to imitate the VM of the novel tasks during VidAS conditions. For future research, it may be beneficial to add an embedded task direction (e.g., "You do it") at the end of videos from the beginning of the study. It may not be necessary for all individuals
while learning SI with VidAS, but for those individuals that need the extra verbal prompt it can serve to promote independence from outside instructors.

The schedule of reinforcement was not thinned during the study. It is important to thin schedules of reinforcement in order to decrease dependence of the reinforcement and increase reliance on SI to complete the task. For future research, reinforcement needs to be thinned in order fade adult support to make students as independent as possible. This will ensure that students can complete SI independently in order for it to become a pivotal skill for them.

**Conclusions**

It is vital that we fade adult supports away from students with ID, with and without ASD, in order to increase their independence. In order to live an independent lifestyle, they cannot always have adults present to provide supports and prompts. It is necessary they have the skills to SI to lead to more inclusive opportunities which could lead to increased self-confidence. By learning SI skills at an earlier age, it increases the likelihood of greater independence and social acceptance. They can be reliant on adult supports when other methods, such as SI using VidAS, can be equally as effective and more efficient and socially acceptable in order to increase inclusion. Self-instruction is a pivotal skill for students to learn, even as early as elementary school to increase their learning outcomes. More research is needed to determine if BST is an effective and efficient way to teach students to navigate technology in order to self-instruct.
Appendix A: VAS and VM of Corresponding Task in VidAS

Running Man

Disco

Lawn Mower
Appendix B: Screened Dance Moves

<table>
<thead>
<tr>
<th>Dance Moves</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cha-Cha</td>
</tr>
<tr>
<td>Salsa</td>
</tr>
<tr>
<td>Sprinkler</td>
</tr>
<tr>
<td>V-Step</td>
</tr>
<tr>
<td>Charlie Brown</td>
</tr>
<tr>
<td>Roll</td>
</tr>
<tr>
<td>Slide</td>
</tr>
<tr>
<td>Lawn Mower</td>
</tr>
<tr>
<td>Shopping Cart</td>
</tr>
<tr>
<td>Thriller</td>
</tr>
<tr>
<td>Step, Clap</td>
</tr>
<tr>
<td>Hand Jive</td>
</tr>
<tr>
<td>Jump and Clap</td>
</tr>
<tr>
<td>Running Man</td>
</tr>
<tr>
<td>Disco</td>
</tr>
<tr>
<td>Drop it</td>
</tr>
</tbody>
</table>
Appendix C: Example of BST Brief Didactic Explanation

When my teacher tells to check my block schedule, I will go get the iPad from the charging station.
## Appendix D: Data Sheet for IOA and Procedural Reliability

### Procedural Reliability

\[
\text{Procedural Reliability} = \frac{\text{behaviors observed}}{\text{behaviors planned}} \times 100
\]

### IOA

\[
\text{IOA} = \frac{\text{agreements}}{\text{agreements} + \text{disagreements}} \times 100
\]

### Data Sheet

<table>
<thead>
<tr>
<th>Date</th>
<th>Session</th>
<th>Task</th>
<th>Student Response (Observed)</th>
<th>Teacher Response (Observed)</th>
<th>Student Response (Planned)</th>
<th>Teacher Response (Planned)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>1</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td></td>
<td>4</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

### Key

- \(+\): behavior observed
- \(-\): behavior not observed

### Additional Teacher Behaviors (10 at 10)

- Memorized pre-organized
- Correct task direction provided
- Check your d messy schedule
- Focus correct responding at same
- List each task in order of
- Prove procedure implemented

<table>
<thead>
<tr>
<th>Task</th>
<th>Total</th>
<th>IOA</th>
<th>TIF</th>
<th>Total</th>
<th>IOA</th>
<th>TIF</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
</tr>
</tbody>
</table>

### Percentage (\%)

- Total +

<table>
<thead>
<tr>
<th>Task</th>
<th>Total</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

38
Appendix E: Data Sheet

BST Data Collection Form (5, 2, 1)

Participant: ____________________________

<table>
<thead>
<tr>
<th>Date:</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Session:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Duration:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Researcher Initials</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IOA initials:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Get iPad from station</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Press home button</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Press home button again to unlock</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Press the MyPics button on iPad</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Press the 'Block' Story on iPad*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pick the 1st picture at the top on iPad*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Press the picture on iPad</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Watch the video of building the blocks.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Put the red block up front</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>put the blue square knob block on top of the other square knob block</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>stack the two knob yellow block on top</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>stack the blue two knob block on top of the yellow block</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Press the green arrow on the right on iPad*</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Press the picture on iPad</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Watch the video of building the blocks.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>put two blue 4 knob long blocks beside each other</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>stack one green two knob block in the back</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>stack one green two knob block in the front</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Press the green arrow on the right on iPad*</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Press the picture on iPad</td>
<td></td>
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<td>Watch the video of building the blocks.</td>
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<td>8</td>
<td>Put the yellow block on the bottom</td>
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<td>9</td>
<td>Stack the blue two knob block on top of the other two knob block</td>
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<td>10</td>
<td>Stack the green two knob block on top</td>
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Key: +: task completed -: task not initiated or completed correctly
References


doi:10.1177/1098300709332346


Shipley-Benamou, R., Lutzker, J. R., & Taubman, M. (2002). Teaching daily living skills


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