2013-12-01

The Effects of Video Prompting via an iPad on Vocational Skill Development of Secondary Students with Developmental Disabilities

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Effects of Video Prompting via an iPad on Vocational Skill Development of Secondary Students with Autism

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A thesis submitted to the faculty of
Brigham Young University
in partial fulfillment of the requirements for the degree of

Master of Science

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December 2013

ABSTRACT

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Current laws stress the importance of using research-based practices to teach transition and vocational skills to students with disabilities. Some of the evidence-based practices include the use of videos to prompt students through a task. Much research has been done concerning the effectiveness of video prompts to teach daily living skills, academic skills and social skills. Transitional skills that have been taught often include simple, entry level skills such as watering plants, cooking soup in the microwave or setting a table. To date, there is little research regarding the use of video prompts to teach complex employment skills that can help students reach competitive employment. The current research attempts to study the effectiveness of video prompting using a multiple baseline ABA research design. Participants included two high school students with autism. Both students were taught how to use woodworking tools to make a key rack. Independent task completion and quality check scores were analyzed and graphed. Both students showed an increase in the number of skills they could perform independently and the overall quality of their work from baseline to intervention. One student was able to maintain the skills after the video prompts were moved. The other student showed a slight decrease in scores after the intervention was removed. Future studies should seek to replicate the study in order to determine a functional relationship between video prompting and independent vocational task completion.

Keywords: video prompting, vocational skills, autism, transition, special education

ACKNOWLEDGEMENTS

I would like to thank my thesis chair, Darlene Anderson. With her wealth of knowledge, dedication to detail and unfailing support, I have gained insight and confidence in the realm of single-subject research. I would also like to thank my thesis committee, Mary Anne Prater and Tina Dyches. Both of these women have been examples to me from the beginning. Their knowledge has blessed the lives of countless students. I have learned from the best.

I would also like to thank my husband, Brent. When most others were scared of my intense passion for Special Education, he embraced it and has helped it to flourish.

Additionally, I would like to thank my Mom and Dad. It was because of them that I got into Special Education. It was because of them that I have strived to set hard goals and reach them. And it is because of them that I will continue to push myself in an effort to make education fruitful and beneficial for all students and teachers.

Lastly, I would like to thank my students. Their potential is limitless. If there is one thing that I would want them to never forget, it is that they are capable of true greatness. I do not think that I ever really taught my students a new skill; I merely unveiled a skill that was always there.

TABLE OF CONTENTS

LIST OF FIGURES

Background

The transition from school to work is an important process that prepares students for meaningful lives by learning necessary skills to access employment and to further their education. Many laws are in place to help students with disabilities transition from school to work including the Americans with Disabilities Act of 1990 (ADA), the Rehabilitation Act of 1973, and the Individuals with Disabilities Education Improvement Act (IDEIA) of 2004. These laws make discrimination against people with disabilities illegal. They also give financial aid to people with disabilities who are working, and mandate quality transition programs (Flexer, Simmons, Luft & Baer, 2005; Mandlawitz, 2007; Neubert, Moon & Grigal, 2002).

Current Issues Among Youth in Transition

Even with current transition laws, problems still exist for students with disabilities as they move from school to adult life. Researchers have found that in spite of the ADA of 1990, the Rehabilitation Act of 1973) and the IDEIA of 2004, students are still experiencing negative post-school outcomes (Grigal, Hart & Migliore, 2011; Hardman, Drew & Egan, 2011; Smith & Stuart, 2002). For example, compared to their nondisabled peers, students with disabilities often experience higher rates of high school failure and drop out, lower employment rates, lower participation in post-secondary education, lower satisfaction in their lives and high rates of unemployment (Grigal et al., 2011; Katsiyannis, Zhang, Woodruff & Dixon, 2005).

Results of the National Longitudinal Transition Survey 2 (2001) indicate that many students with disabilities are unable to obtain a minimum paid job in integrated settings; instead, they work in sheltered workshops. Sheltered workshops are work environments designed for people considered to be too disabled to function in a setting with their nondisabled peers. The concept of sheltered employment first began in the 1970s and was designed to provide a protective environment that would teach simple work skills (Unger & Simmons, 2005). Results of current studies indicate that as many as 68.6% of students with developmental disabilities are working in a sheltered workshop setting (Grigal et al., 2011). While sheltered workshops provide work for students with disabilities, they provide little connection with mainstream society and limited opportunity for advancement into integrated work settings (Grigal et al., 2011; Hardman, et al., 2011; Smith & Stuart, 2002). Moreover, skills taught in sheltered work settings are not skills that can be easily transferred to integrated work settings. It has been assumed that work in integrated settings is too complex for students with disabilities (Mechling & Ortega-Hurndon, 2007). Thus, the skills taught in sheltered settings tend to be extremely simple and repetitive (Migliore, Grossi, Mank & Rogan, 2008; Migliore, Mank, Grossi, & Rogan, 2007). These skills include sorting screws, folding paper and other simple assembly skills. Furthermore, when students enter a workshop setting they rarely leave that environment. It has been stated that students placed in segregated workshops are more likely to "die of old age" than enter an integrated setting (White & Weiner, 2004, p. 150).

Possible Solutions for Poor Employment Outcomes

Despite current trends regarding negative postsecondary outcomes for individuals with disabilities, a number of solutions are currently under investigation (Agran & Krupp, 2011; Grigal et al., 2011; White & Weiner, 2004). These suggestions include having high expectations of students, using preference assessments to determine potential job settings and providing opportunities for supported employment.

High expectations. In order for students to enter and succeed in integrated settings, professionals, parents, and students need to set and maintain high expectations. When service providers and parents hold low expectations regarding the type of work students are capable of, the students are limited to employment in entry-level, low-skilled jobs (Grigal et al., 2011). Grigal and colleagues (2011) found a correlation between high expectations from parents and professionals in relation to school completion and attendance in a post-high school program for students with disabilities. According to these researchers, positive expectations can lead to student success. They also found that students had high expectations for themselves when parents had high expectations for them. Findings suggest that maintaining high expectations can positively affect a student's self-image.

Preference assessments. According to IDEIA 2004, transition plans and services need to be based on students' current vocational skills as well as their vocational preferences. This is known as person-centered planning (Katsiyannis et al., 2005). Specific emphasis should be placed on students' vocational and employment preferences (Morgan, Morgan, Despain, & Vasquez, 2006; Reid, Parsons, & Green, 1998).

In fact, research suggests that when a person-centered job selection approach is used, students are able to achieve a higher quality of life, their job performance improves, and the occurrence of negative behaviors in the workplace is reduced (Agran & Krupp, 2011; Morgan, 2008; Morgan & Harrocks, 2011). Some individuals may worry that students will prefer a job that is beyond their current skill level. However, researchers have found that students are more likely to be motivated to obtain the necessary skills if they are working in a preferred job (Agran & Krupp, 2011; Morgan, 2008). Thus, the effort needs to be made to help students with disabilities develop vocational skills in areas of preference.

Supported employment. Supported employment attempts to integrate people with disabilities into mainstream work conditions by providing them with various supports so they succeed in meeting job demands (Lancioni, O'Reilly, Seedhouse, Furniss & Cunha, 2000; White & Weiner, 2004). For this reason, supported employment may be a better option than sheltered workshops for many students with disabilities (Lancioni et al., 2000; White & Weiner, 2004). Researchers have found that individuals engaged in supported employment have higher levels of self-esteem, experience increased social acceptance, attain a higher quality of life, receive better wages, achieve greater independence, and acquire more skills than those who work in sheltered workshops or who do not work at all (Stevens & Martin, 1999). Thus, it is important for service providers to prepare their students to work in integrated settings.

Technology Used to Teach Employment Skills

People with disabilities often lack the skills needed to complete various vocational tasks, especially those required in an integrated work setting. Research has shown that technology can be especially useful for students learning vocational skills and applying those skills in an actual setting (Lancioni, Raimondi & Giattaglia, 1989; Wehmeyer, Palmer, Smith, Parent, Davies, & Stock, 2006). The technologies included in the current study are static picture prompts, video prompting and video preference assessments (p. 9). Each will be discussed.

Static picture prompts. Static pictures prompts are cues in the form of pictures that guide students through multi-step tasks or help them transition between different tasks (Mechling & Gustafson, 2008). They are often used for students who are unable to read the written word and help decrease dependence upon someone to provide verbal prompts. Using pictures to direct a student can be in the form of pictures pasted into a booklet or pictures on a computer. Picture prompting systems located in a book typically require a student to look at a picture, perform the task depicted, cross off the picture when they have completed the task and move on to the next task (Banda, Dogoe & Matuszny, 2011; Mechling & Stephens, 2009). The current research uses static picture prompts to guide students through iPad use. Using an iPad to access materials requires multiple steps; thus, using picture prompts to help students regulate their ability to perform the necessary steps was essential.

Video prompting. Video prompting is a valuable technology shown to be beneficial when used with people with disabilities (Alberto, Cihak & Gama, 2005; Le Grice & Blampied, 1994; Mechling, 2005). The method involves the use of a combination of pictorial and auditory cues that are video recorded and then shown to the student. In video prompting intervention, the steps to complete a task are shown on a video a single step at a time (Banda et al., 2011; Mechling 2011; Van Laarhoven & Van Laarhoven-Myers, 2006). Video prompts are preferable to prompts involving people because they are more likely to impact the level of independence with which the task is performed (Chang, Chen, & Chuang 2011; Cihak, Kessler, & Alberto, 2007; Sigafoos et al., 2005; Van Laarhoven & Van Laarhoven-Myers, 2006).

There are many benefits to using video prompting. First, because students with disabilities often require prompting to acquire and maintain a task, technology such as video prompting allows for greater independence because it decreases reliance on another human being to give the prompts (Carmien et al., 2005). Moreover, video prompting may be the preferred option when the task is complex and involves numerous steps (Mechling, 2007; Mechling & Gustafson, 2008; Mechling & Stephens, 2009). Students with disabilities may find it difficult to remember the sequence of steps, especially in tasks that require a large number of steps. Technology can help the student accurately perform tasks with many steps. In addition, video prompting may be the best intervention for some populations because when compared to prompting by a person, it places fewer demands on the student, requiring less ability in the area of attention (Chang et al., 2011; McCoy & Hermansen, 2007; Sigafoos, et al., 2005).

Problem Statement

While current research demonstrates that video prompting can be a viable teaching tool for students with disabilities, little research has been conducted examining the effects of video prompting with older students (Delano, 2009; Hitchcock, Dowrick & Prater, 2003). In addition, research has not yet addressed the question of whether the method can be used to teach certain types of vocational skills (Allen, Wallace, Greene, Bowen & Burke, 2010; Cihak, Kessler & Alberto, 2008; Mechling & Gustafson, 2008). For example, the majority of studies investigating the use of video prompting to teach vocational skills has focused on simple entry-level services such as cleaning, or the assembly of items (Cannella-Malone et al., 2006; Cihak et al., 2008; Van Laarhoven & Van Laarhoven-Myers, 2006). Additional research is needed to teach vocational tasks that are meaningful and complex (Allen et al., 2010; Cikak et al., 2008; Van Laarhoven et al., 2007).

Purpose of the Study

The purpose of the study was to extend the literature in video prompting in two important ways. The first objective was to examine the use of video prompting with older students with autism. The second objective was to evaluate the effects of video prompting to teach complex vocational tasks.

Research Questions

Given the need to teach complex vocational skills to adolescents with autism the following research questions were addressed.

1. What are the effects of video prompting on adolescents' with autism independent skill performance on a preferred complex vocational task?
2. What are the effects of video prompting on adolescents' with autism quality of work on a preferred complex vocational task?
3. What are the effects of a self-regulation strategy with a system of least prompts on adolescents' with autism independent use of an iPad?

Methods

The following paragraphs describe the experimental procedures in a research study that examined the effects of video prompting on the independent skills performance of adolescents with autism. The vocational task most preferred by participants was learning to make a wooden key rack.

Participants

Three participants were selected to participate in the study based on their responses to a preference assessment. However, only two students actually participated in the study due to unusually high baseline scores for one of the students. Written parental consent and participant assent were also obtained in accordance with university institutional review board procedures.

Participant description. Brady was a 15-year-old male student with a medical diagnosis of autism. Additionally, Brady was assessed using the *Childhood Autism Rating Scale* (CARS; Schopler, Reichier, & Renner, 1988). His intellectual functioning (IQ) was tested using the *Stanford-Binet Intelligence Scales* (SB5, Roid, 2003). Results indicated an IQ score of 46, suggesting moderate cognitive delay compared to typically-functioning peers. The *Vineland Adaptive Behavior Scales* (VABS, Sparrow Cicchetti, & Balla, 2005) indicated a score of 45 in daily living skills, 69 in communication, and 61 in socialization. Results of the Vineland communication assessment disclosed a score of 52, in the low range of performance.

Ria was a 17–year-old female student with a medical diagnosis of autism and similar diagnosis following the administration of the *Childhood Autism Rating Scale* (CARS, Schopler, Reichier, & Renner, 1988). Ria's intellectual functioning was tested using the *Wechsler Nonverbal Scale of Ability* (WNV; Weschler & Naglieri, 2006). She received a score of 32 on the WNV, indicating extreme cognitive delay compared to typically-functioning peers. Ria's adaptive functioning levels were assessed using the *Vineland Adaptive Behavior Scales* (VABS, Sparrow Cicchetti, & Balla, 2005). Results indicated a score of 54 in daily living skills, 56 in communication and 57 in socialization.

A score of 56 on the Vineland communication assessment indicated low functioning in the area of communication.

Mark was an 18-year-old male with a medical diagnosis of autism. During baseline he completed 9 out of 15 steps correctly. He also received a quality check score of 37 out of 75. Mark was able to look at an unfamiliar tool and use it correctly by examining its parts. For instance, although he had no previous experience using a hand drill, when presented with the drill, Mark immediately placed the tip into the wood and turned the handle to make the drill go down into the wood. His high baseline scores suggested that video prompting might not be the best intervention for him. He was therefore removed from the study and continued woodworking without the aide of the video prompting intervention.

Video preference assessments. Video preference assessments present clips depicting various work conditions and duties. Students are then asked to choose which video best depicts a job they would prefer to engage in. With regard to communicating job preferences, researchers have found that preference assessments depicted in a video may be a better alternative than static pictures of objects, when working with students who have autism or other developmental disabilities. According to prior research (Morgan & Ellerd, 2005; Morgan & Horrocks, 2011; Morgan et al., 2006; Stock, Davies, Secore & Wehmeyer, 2003), showing students videos of various employment options and asking them to pick the one they would like to do is an effective way to determine job preference. In addition to having a student view videos of employment options, students need to engage in both options to make an informed decision about the one they would prefer. After students have experienced both jobs they are asked which one they would want to do again (Ellerd, Morgan & Salzberg, 2006). The video they choose is considered to be the student's preference. Once job preferences have been assessed, teachers can use video prompts to teach students necessary skills to perform the task.

Preference assessment results. The researcher picked two tasks representing complex skills and the potential to be useful in a generalized setting. During the preference assessment, students had the opportunity to learn a sewing skill that would teach students to use common sewing machines and tools. The skill had the potential to be generalized to small sewing businesses in the community. Participants also had the opportunity to learn how to make a key rack using various woodworking tools. This task also had the potential to be generalized to simple in-home repair companies. Initially, five students in the researcher's classroom viewed a video model of two tasks that were similar in demand and complexity in a one-on-one setting. One task involved using a sewing machine and iron to make an appliqued hand towel. The other task required the use of a hand drill to bore a hole in a piece of wood. Preference assessments were conducted in a separate room with a teacher collecting data and a school psychologist administering the assessment. The students were subsequently invited to engage in the same task. The students then viewed a video of an individual making a wooden key rack. After the students had viewed both videos and participated in each activity, the teacher held up a towel and a wooden key rack, and asked, "Which one do you want to do?" The item selected was considered to represent the student's preferred task (Ellerd et al., 2006). Brady indicated a preference for woodworking by verbalizing the words, "key rack," and touching the key rack. Mark indicated a preference for woodworking by touching the key rack and attempting to engage in the task again by grabbing necessary tools. Ria indicated a preference for woodworking by touching the key rack and stating, "Make a key rack." Because all students showed a preference for woodworking, they were considered optimal participants for the study.

In order for the participants to acquire a new skill through the use of video technology, they needed to be able to attend to the video for at least 22 seconds. This number was selected because the longest video clip was 22 seconds in length. In addition, they needed to be physically capable of imitating simple skills such as grasping tools with a whole hand, rotating a handle clockwise and counter clockwise, and twisting a small brass hook with their fingers. Each of the participants had previous experience working with wood.

Setting

The study was conducted in the researcher's classroom, located in a self-contained special education school for students with developmental disabilities. Ten teachers, four related service professionals and 34 classified staff served the ninety-one students. Students with the following disability categories received services: autism, developmental delay, intellectual disability, multiple disabilities, other health impairments, deaf blindness, and traumatic brain injury. The students, 55 males and 36 females, ranged in age from preschool to post-high school. Of the 91 students, 10 were Hispanic, three were Native American, two were Asian American and one was Indian.

Twelve students between the ages of 14 and 20 were enrolled in the classroom in which the study was conducted. The classroom contained 11 desks, two computers and two tables. A counter on the left side of the room was used for sewing. The work area contained one sewing machine, a chair, a box of fabric, an ironing board and iron. An electrical outlet was located underneath the counter. One teacher, three full time paraeducators, and one part time paraeducator worked in the classroom. Eight of the students had autism, three had an intellectual disability and one had multiple disabilities. Eleven of the students were Caucasian and one was Asian. All twelve students qualified for adapted physical education and speech services and three qualified for occupational therapy.

Materials

The students used a plank of wood (3 ½ inches by 12 inches), one spring loaded punch, one Fiskars hand drill, one 3/32 inch drill bit with tape marked ½ inch from the top of the bit, three brass hooks and one iPad 2. An FE-310 Olympus Digital Camera was used to record all video clips. Clips were downloaded onto a MacBook Pro computer. The researcher used iMovie to edit the clips into a video prompting sequence. After the clips were edited they were transferred from the computer to an iPad using a jump drive.

Video prompts were recorded with the digital camera using a subjective view. A subjective view is filmed from the point of view of the person performing the skill. This means that only the hands and arms are seen (Van Laarhoven, Zurita, Johnson, Grider, & Grider, 2009). The subjective view has shown to be especially useful when teaching skills that involve fine motor tasks (McCoy & Hermansen, 2007). A slide with verbal and written directions for completing each step was played for five seconds. The video prompting segment for the first step of the task analysis was shown. Only the model's hands were seen on the video slide. All subsequent steps were filmed in this way. The researcher acted as the model for the films and her voice was recorded for each step.

Response Measurement and Data Collection

Utah State Core Standards for Introduction to Construction Technology states that students are expected to use common hand tools found in the construction industry (Standard 4). Students in a general education setting typically do this by checking guide sheets and instruction manuals. Students in the current study showed competence by following a step-by-step procedure demonstrated through video prompts. Participants' mastery of the learning objective (Utah State Core Introduction to Construction Technology Standard 4) was assessed by counting the number of steps performed independently. A student's performance was scored as correct, incorrect, or as a refusal to perform the task. Steps were presented using total task presentation. The task analysis is displayed in Appendix B.

Participants' quality of work was likewise assessed using a five point rating scale (included on the task analysis data sheet in Appendix B). The quality of the students' work was assessed according to preset standards based on visual appearance and function at each step of the task analysis. The average quality-check score for each session was graphed.

Students' independent use of the iPad was measured using event recording to determine the number of prompts students needed per session. To assess students' ability to self-regulate their use of the iPad, the students implemented a self-evaluation/self-recording procedure. This procedure included five 2x3 inch pictures showing the steps needed to use the iPad (see pictures in Appendix B). The self-regulation prompting system was used vertically from left to right and was taped onto the counter to the left of the student. Students used the system by touching the first picture and performing the corresponding action in relation to operation of the iPad until the session was over. The researcher documented in writing the accuracy of implementation for each session (see scoring form in Appendix B).

Interobserver Agreement

Reliability checks were made by an independent observer for approximately one third of the sessions during baseline, intervention and maintenance phases. Prior to the commencement of the study, the first and second coders practiced the scoring procedures until 90% agreement had been achieved across three consecutive sessions. Observer scoring records were compared item by item and an agreement was tallied if both coders recorded identical scores. Percentage agreement was calculated by dividing the number of agreements by the number of agreements plus disagreements and multiplying by 100 (Gast, 2010).

The researcher trained the second coder before the baseline and intervention sessions began. The training included a basic demonstration of the woodworking machines and the iPad. The second coder was shown how to turn the iPad on, select the appropriate program for video prompting, pause the video and play the video. In addition, the researcher instructed the coder regarding the data collection system and the quality checklist form. The coder practiced collecting data on both forms by viewing someone not involved in the study performing the task. The coder also collected quality data on a finished product using the quality checklist. Training was deemed to be complete when the researcher and second coder had achieved 90-100% agreement for at least three consecutive sessions.

Interobserver agreement scoring records were compared step by step. An agreement was tallied if both coders recorded identical scores on each step of the task analysis. Interobserver agreement was calculated to be 100% for the task analysis, 93% for the quality checklist and 90% for the number of prompts required to access the iPad.

Experimental Design

Intervention effects were evaluated using a multiple baseline across participants design. Data were collected on the number of steps performed correctly. Direct observational data were collected to indicate the number of steps of the woodworking task performed correctly in the presence of the video prompt. In the multiple baseline across participants design, baseline data must demonstrate a stable trend before the intervention is introduced to the first participant. When intervention data are stable across at least three sessions for the first participant, the intervention may be introduced to the second participant.

Experimental Procedures

The study included baseline, intervention, and post-intervention phases. Prior to the commencement of the study, students in the researcher's classroom participated in a class-wide token economy. During all experimental phases, a token economy system that consisted of generalized reinforcers, (i.e., money, back-up reinforcers) was used to encourage participants to engage in the woodworking task. However, positive reinforcement was not used during the baseline, intervention, or post-intervention phases to acknowledge correct task completion. Each participant was given the opportunity to choose a reward from a reinforcement menu. The menu included small reinforcers such as gum, crackers, juice, talking to a friend, or five minutes of a preferred activity.

Participants received a quarter when they stayed on task for a given period of time. When they received four quarters they were eligible to receive the back-up reinforcer of their choice. The reinforcement schedule was individualized based on student need and remained consistent for each participant throughout all three phases of the study.

Baseline. Baseline data were collected two times per day, once in the morning and once in the afternoon. Sessions were conducted at the same time of day during the study. Students were provided all necessary materials to complete the task including wood with three marks indicating where to drill the holes, a spring loaded punch, three hooks, a hand drill with drill bit already in place and yellow tape on the drill bit indicating when to stop drilling the hole. The researcher held up an example of a correctly constructed wooden key rack and gave the direction, "Make a key rack like this." Without giving prompts, the teacher observed the student while recording the number of steps the student completed independently. Data were recorded on a scoring form similar to the one shown in Appendix B.

If the participant showed an inability or lack of willingness to begin the task or demonstrated off-task behavior such as not looking at the task, not using hands to work, or verbalized "no"/ "not now"/ "break," over a one-minute time period, the researcher prompted the student to ask for a break by saying, "Do you need a break?" If the participant indicated "yes" through verbalization or use of an augmentative and alternative communication device or sign language, the student was given a break and the teacher terminated the session. If the participant indicated he or she did not need a break, the researcher continued the session.

Intervention. Intervention data were collected twice daily during vocational instruction. The student participant, instructor/researcher, assistants collecting inter-reliability and/or treatment fidelity data and one or two other students not participating in the study were present during the implementation of the intervention. Students were specifically taught how to use common woodworking tools to make a key rack.

Task analysis. The steps of the task analysis (see Appendix B) were

1. Pick up spring loaded punch, put the tip of the punch on the first mark on the wooden plank and use two hands to push down on the punch until it springs back.
2. Move to the second hole and perform the same action as step 1.
3. Move to the third hole and perform the same action as step 1.
4. Pick up the hand drill, put the bit into the first hole, use left hand to hold the body of the drill and use the right hand to turn the handle clockwise.
5. Use left hand to continue grasping drill, use right hand to turn the handle counter clockwise while simultaneously pulling the drill upward until the drill is no longer in the wood.
6. Put the drill bit into the second hole, using left hand to hold the body of the drill and using the right hand to turn the handle clockwise.
7. Use left hand to continue grasping drill, use right hand to turn the handle counter clockwise while simultaneously pulling the drill upwards until the drill is no longer in the wood.
8. Put the drill into the third hole, using left hand to hold the body of the drill and using the right hand to turn the handle clockwise.

9. Use left hand to continue grasping drill, use the right hand to turn the handle counter clockwise while simultaneously pulling the drill upward until the drill is no longer in the wood.
10. Pick up the hook and put the screw into the first hole.
11. Use left hand to hold the hook in place and the right hand to twist the hook clockwise. Student will continue this motion until the hook is tight and the tip is pointing upward.
12. Pick up the hook and put the screw into the second hole.
13. Use left hand to hold the hook in place and the right hand to twist the hook clockwise. Student will continue this motion until the hook is tight and the tip is pointing upward.
14. Pick up the hook and put it into the third screw.
15. Use left hand to hold the hook in place and the right hand to twist the hook clockwise. Student will continue this motion until the hook is tight and the tip is pointing upward.

Self-regulation strategy and system of least prompts. Participants additionally used a self-regulation procedure that required them to turn on the iPad, unlock the device, locate the correct program, push play to view a clip, and push pause to stop viewing a clip. A visual prompt consisting of static pictures was taped on the counter. The self-regulation strategy required the student to touch a static picture representing each step prior to performing the task. If the student failed to self-regulate a particular step within 10 seconds, the researcher delivered a prompt using a system of least prompts (e.g., first a gestural prompt, then partial physical prompt, and finally a full physical prompt). The student accessed the video prompts on the iPad and performed the steps one at a time.

Scoring procedure. After the participant correctly performed the initial task viewed on the video, she or he watched and performed each subsequent step. The teacher marked correct performance as a "+" on the data sheet. If the participant did not perform the step correctly or refused to perform the step, the researcher removed the student from the room to ensure that they were not acquiring the skill through teacher modeling. The teacher completed the missing step, and then returned the student to the room to perform the remaining steps. If the participant performed the task incorrectly, the researcher recorded the attempt as "—." If the participant refused to perform the task, the researcher recorded the attempt as an "x."

Post-intervention. Post-intervention data were collected after the participants had reached the criterion level of performance in the intervention phase. Students needed to complete their preferred task with an average of at least 80% accuracy over 3 trials and with an average of at least 45/ 75 on the quality checklist over 3 trials (this score required the student to achieve at least a three on each step). A score of 45 indicated that each step was performed well enough to lead naturally into the next step. Post-intervention conditions were identical to baseline. No video prompts were presented during this phase.

Data Analysis

A multiple baseline across participants design was used to evaluate the effects of video prompting via an iPad on the participants' completion of a preferred complex vocational task. Visual analysis and effect size using the Improvement Rate Difference

(IRD) (Parker, Vannest, & Brown, 2009) were used to summarize and interpret the data. The percentage of non-overlapping data (PND) and the percentage of data points exceeding the median of the baseline phase (PEM) were likewise calculated to evaluate student performance in baseline, intervention, and post-intervention phases.

Despite the availability of additional procedures, experts contend that a visual analysis may be preferable to other methods because it allows the data to be organized in a comprehensible way (Gast, 2010). It is acknowledged that visual representations of data have the capacity to communicate clear relationships between independent and dependent variables.

During baseline, intervention, and post-intervention phases, the researcher graphed and analyzed individual student performance. Based on the criteria indicated on the quality checklist, product quality was similarly assessed.

Treatment Fidelity

The teacher collected data during each intervention session. An independent observer recorded data while observing the student and teacher during 33% of the intervention sessions. Treatment fidelity measures ensured that materials were set up correctly and the teacher was implementing instruction and collecting data as outlined. The treatment fidelity forms are included in Appendix C.

Social Validity

Studies need to make progress in identifying socially relevant behaviors and interventions that can be used in school settings (Gast, 2010). A social validity questionnaire was administered to study participants to assess the acceptability of the goals, procedures and results of the study (Wolf, 1978). The participants were asked to respond to five questions (e.g., “Do you like working alone or in a group?” “Do you like learning on a computer or an iPad?”) to determine their level of satisfaction with the intervention. The assessment was designed to align with the participants’ cognitive abilities. Participants were presented with two pictures representing possible choices and were asked to make a selection. The researcher read the question out loud, presented the two options, waited for a response and recorded the answer. If a response was not provided, the teacher repeated the question. If a response was not provided following the second request, the researcher indicated the participant’s refusal to answer on the scoring form. An example of the social validity questionnaire and data scoring sheet are included in Appendix D.

Results

A multiple baseline design across two participants was used to evaluate the effects of video prompting presented via an iPad on the independent skill performance of secondary students with autism when completing a preferred complex vocational task; or, more specifically, when making a key rack (see Figure 1). The work quality of the finished product was likewise evaluated using a five-point Likert Scale (see Figure 2). According to the scale, high scores achieved on individual steps (a score of 4 or 5) indicated students used tools correctly, the task was performed neatly with few or no mistakes, and the overall product was completed well enough for the sequential steps to be completed with ease. Scores in the middle range (3) indicated the student attempted to use the tool, but the action was not performed well enough to facilitate completion of the next step. Scores in the low range (2 and 1) indicated participants partially attempted the skill or did not attempt the skill at all.

Data were also collected on students' ability to independently use the iPad (see Figure 3). This required that participants turn on the iPad, select the correct program, pause the movie between video clips, and press play when finished performing the task. Participants were additionally provided static picture prompts of an individual using the iPad during the intervention phase. Frequency data were collected on the number of prompts students received based on a system of least-most prompts. Prompts given for independent iPad use included full physical, partial physical, model, gesture, and independent task completion. The researcher recorded the most intrusive prompt needed to complete the task.

Results indicated that students were able to use the tools correctly when shown a video model. Students were required to achieve at least 80% accuracy on independent task completion for three consecutive days before moving to post intervention or the second baseline phase. In addition, students were required to receive a quality check score of at least 45 out of 75 points for three consecutive days. After students achieved the criterion, they were allowed to move to the post-intervention or second baseline phase, in which the intervention was removed to assess skill maintenance.

Participant Scores

The primary dependent variable was the number of steps students completed accurately during baseline, intervention, and post-intervention phases. Changes in level, trend, and variability were analyzed across and within phases. In addition, quality check scores were graphed for each session. A student could receive a maximum of 5 points on each step of the task analysis, thus, a maximum score for each quality check was 75 points. The number of prompts participants needed to access the iPad through a picture system was also recorded. The researcher attempted to determine the effects of the independent variable, video prompting via an iPad on participants' independent skills performance by analyzing and interpreting data through graphic analysis, effect size, PND (percentage of non-overlapping data), PEM (percentage of data exceeding the median of baseline) and IRD (improvement rate difference).

Because the research was conducted during summer school and time was limited, two sessions for each participant were conducted each day during baseline, intervention and post-intervention phases. Results indicated that levels of independent task completion increased during the two phases following baseline; quality checks recorded during the intervention and the post intervention phase also suggested that participants created a product of acceptable quality. Results of the data collection effort for the individual participants are described below.

Brady. Brady's pre-assessment clearly indicated his preference for woodworking. Moreover, like Ria, Brady seemed to memorize the phrases used in the video prompts. During intervention and post-intervention conditions, he verbally guided himself through the task analysis by repeating information from the video. This was especially effective when the video prompting was removed during the post intervention phase.

Baseline. The average number of steps Brady completed independently or without some level of assistance across four baseline sessions was 1.5 (range, 0-3) of 15 required steps.

Intervention. Brady independently completed an average of 14.75 (range, 14-15) steps independently during the intervention phase. When the video prompting intervention was initiated, an immediate and abrupt change was observed in the number of steps Brady completed without assistance (see Figure 1). To assess differences in performance between baseline and intervention phases, the percentage of data points exceeding the median (PEM) was calculated (Parker & Hagan-Burke, 2007). Brady's results disclosed a PEM of 84%. The percentage of non-overlapping data (PND) was likewise calculated to compare the data of the two adjacent conditions (Gast, 2010). The PND was 100%. In addition, the improvement rate difference (IRD) was calculated to determine the effect size (Parker, Vannest & Brown, 2009). IRD was likewise 100%, suggesting a marked difference in Brady's independent task completion during video prompting compared to his performance during the first baseline phase.

Post-intervention. When Brady averaged 15/15 steps completed correctly over four sessions, he was moved to the post-intervention condition. The video prompting system was removed and his scores remained at 15/15 for all five post-intervention trials.

Quality check. Quality check scores were recorded using a 5-point Likert scale to measure overall function and appearance. During baseline, Brady achieved a median score of 6 (range, 0-15) over 4 trials. His performance improved during the intervention, indicated by a median score of 63.5 (range, 63-69) over 3 trials. Finally, during the post intervention phase, Brady achieved a median quality check score of 64, demonstrating that his performance remained stable.

Self-regulation strategy and system of least prompts. Data were collected during the intervention phase to assess Brady's ability to independently use the iPad. During the first intervention session, Brady required 41 prompts in addition to the static picture prompts. During the final intervention session, Brady required only four prompts (two verbal and two gesture prompts) during the session to access the iPad. The increased independence suggests that Brady acquired the skills needed to use the iPad without assistance.

Ria. Ria's initial preference assessment clearly indicated a liking for woodworking. Although Ria engaged in off-task behaviors (e.g., leaving the work area, jumping, hand flapping) during the intervention and post intervention phases, anecdotal data indicated a significant decrease in Ria's off task behavior during the intervention compared to baseline. Performance data clearly indicated that Ria acquired functional skills related to woodworking during the intervention phase (see Figure 1). It was also noted that Ria verbalized the directions that she heard on the video while performing the tasks in intervention and post intervention phases.

Baseline. Ria completed an average of three steps independently during baseline sessions. Anecdotal information indicated that she engaged in many off-task behaviors including obsessive self-talk unrelated to the task at hand, standing on chair, waving to people in the work area, hand flapping and jumping. She also engaged in behaviors that decreased her quality of work. She used tools inappropriately which often resulted in property destruction.

Intervention. The participant independently completed an average of 14.75 (range, 14-15) steps across intervention sessions. Data calculations disclosed a PEM of 100%. The PND and the IRD were also 100%. Thus the data disclosed a marked increase in the number of steps Ria completed independently when presented with video prompting via an iPad and a visual task analysis to help her use the iPad independently.

Ria's on-task behavior additionally improved during the intervention phase. For example, her self-talk was more centered on the topic at hand. She often repeated phrases verbatim, to herself from the video. In addition, her attention was more focused on the task at hand during intervention compared to baseline.

Post-intervention. Due to the time limits established for the study, Ria was unable to meet performance criteria with respect to achieving a highly stable data pattern during the intervention phase. However, because the final data point was consistent with the first three and indicated an upward trend, the decision was made to move to post-intervention. Data remained high at 15/15 for the first session and then lowered to 11/15 for the second and last session. These scores suggest that Ria was able to maintain previously acquired skills for a short time. Quality check scores showed a similar trend. The first post-intervention score was 60/75. However, the second and final score decreased to 50/75.

Quality check. Quality check scores were recorded using a 5-point Likert scale to measure overall function and appearance. As previously mentioned, it was possible for participants to obtain a total of 75 points. During baseline Ria obtained a median quality check score of 15. During intervention, Ria's score increased to a median of 59 (range, 42-60). During post-intervention, Ria obtained a median score of 55 (range, 50-60).

Self-regulation strategy and system of least prompts. Data were collected during the intervention phase to assess Ria's ability to independently use the iPad. During the first intervention session, Ria required a total of 43 prompts. By the end of the intervention phase, Ria required only 34 prompts. In addition, most prompts used at the beginning of the intervention were more intrusive (full physical prompts and partial physical). However, by the end of the intervention phase, Ria required fewer intrusive prompts (mostly modeling and gesture prompts).

Social Validity Measure

Social validity was assessed by asking the participants their preferences with respect to setting, learning style, and task preference. The vocabulary used in the questions and answers had been previously taught to the participants throughout the year in one-on-one and in-group settings in the classroom. Vocabulary concepts were further generalized to different activities and times in the day.

The social validity questionnaire consisted of four questions. The researcher verbally read each question while simultaneously presenting a visual representation to the participant. Answer choices for each question were presented on 3 inch by 3 inch laminated cards with icons and words. Both answer choices were placed 12 inches away and directly in front of the participant. In order to determine whether the student was indicating a genuine preference or arbitrarily pointing to a picture, questions were formatted similar to a paired stimulus preference assessment. In other words, the stimuli were presented to the participant in pairs. The participant was allowed to pick one of the two stimuli. Preference for a certain stimulus was determined by calculating the number of trials a stimulus was selected over the total number of times it was presented (Hagopian, Long & Rush, 2004).

Participants could either respond verbally or select an icon. The results of the social validity questionnaire are displayed in Appendix D. An "x" next to a particular stimulus indicates the item was chosen as a preference during a given trial. The number of times each option was picked over the total number of times the question was asked is also presented. The researcher assumed the most frequently selected option represented the student's preference. Results of the social validity questionnaire suggested both participants preferred learning skills via an iPad compared to the teacher's presentation. In addition, both students indicated a preference for working in a group. Additional questions were used to gain information about the types of skills the participants would like to learn. Brady indicated that he would prefer to learn different skills, while Ria indicated that she preferred learning the same thing.

Discussion

The results of the current study suggested that video prompting may be an effective way to teach adolescents with developmental disabilities to independently complete complex vocational tasks and acquire skills essential to obtaining competitive employment. Participants not only acquired a novel skill, but also learned to use machines (i.e., spring loaded punches and hand drills) and complex procedures (i.e., drilling a hole to the appropriate depth and removing the drill without breaking the bit) to make a key rack. In addition, results suggested the use of video prompting during instruction can improve overall product quality. In the baseline phase, students' scores were relatively low with respect to overall appearance and product quality. However, during the intervention phase, product quality improved dramatically.

Current Findings Related to Previous Research

Previous literature underscores a need to provide inclusive employment for individuals with disabilities (Katsiyannis et al., 2005; Unger & Simmons, 2005; White & Weiner, 2004). Studies specifically suggest that when students with disabilities lack gainful employment, they are at increased risk to lose previously developed skills

(Migliore et al., 2007), have less meaningful social interaction with non-disabled peers (Grigal et al., 2011), earn less money (Migliore et al., 2007), and experience lower levels of satisfaction in their lives (Katsiyannis et al., 2005). Providing supported employment to individuals with disabilities has been suggested as one way to combat these problems (Stevens & Martin, 1999). Current findings are in agreement with previous research demonstrating the successful use of technology to help students with disabilities acquire vocational skills that may lead to supported employment (Taber-Doughty, Bouck, Tom, Jasper, Flanagan & Bassette, 2011).

Present results extended the video prompting literature by evaluating a broader range of skills than previously examined. Although a number of earlier studies investigated the use of video modeling and video prompting to help adolescents acquire important life skills (Cannella-Malone et al., 2006; Mechling & Stephens, 2009; Sigafoos et al., 2007), relatively few studies had examined the use of video modeling or video prompting to teach adolescent students with autism to perform a complex task that incorporated various machines.

In addition, the present study used preference assessment techniques shown to adequately predict vocational preferences for students with severe disabilities (Ellerd et al., 2006). These techniques included giving students the opportunity to watch a video depicting the job and allowing students to engage in the job-related task before making a decision about their preference. Based on anecdotal data, current findings additionally confirmed previous results indicating that when students are engaged in preferred jobs, negative behaviors tend to decrease, time on task tends to increase, and students are able to acquire complex skills related to the task in a more timely manner than previously observed (Agran & Krupp, 2011; Guess, Benson, & Siegel-Causey, 2009; Morgan, 2008; Morgan & Horrocks, 2011).

During baseline, Brady demonstrated off task behaviors including looking away from work, inappropriate use of hands, and talking/singing to himself. These behaviors obviously distracted him from his work. During the intervention, Brady used his hands to appropriately manipulate tools and materials. His self-talk changed from non-contextual scripting to using words that guided his behaviors. For example, he often repeated directions while performing the desired action. This further helped him remember steps during the post-intervention phase when the video prompting was removed.

Like Brady, Ria demonstrated off-task behavior during baseline that interfered with her work and occurred at a reduced rate during the intervention and post intervention phases. Ria was also observed to mimic the phrases used in the video prompts. These self-made verbal prompts helped her remain on task and acted as a support when the video prompts were removed.

Limitations

While the findings of this study demonstrate the utility of using video prompting to teach complex vocational tasks to adolescents with disabilities, several limitations may be noted. First, the amount of time in which the study was conducted was restricted because the research took place during summer school. Sessions were conducted twice daily to allow for a greater number of data points to be collected before the end of the term. A longer post-intervention or maintenance phase may have strengthened the results.

The fact that only two students participated in the study additionally limits the interpretation of the findings. Although five students were initially selected to receive the preference assessments, only two students who needed the intervention indicated a preference for woodworking. The two examples presented therefore represent case studies rather than experimental research in which causation might be inferred (Kazdin, 1982).

Implications for Practice

The current research clearly suggests that students with disabilities can benefit from receiving instruction in complex vocational skills. In this particular example, the participants' inability to use the spring-loaded punch prior to intervention indicated they could not perform all of the steps, resulting in the product being only partially completed. If an observer had examined the product prior to training, she or he would have noted a piece of wood with three shallow holes. However, during the intervention, participants' quality check scores markedly improved. The students were able to effectively use a hand drill to bore holes of an appropriate width and depth, allowing hooks to be placed into each one. The increase in quality across steps noticeably improved the product's appearance and function. The outcomes of the current research therefore demonstrate the value of the teaching methods and technology used and suggest that applications to similar settings and students may be appropriate.

Implications for Future Research

While this study demonstrated the potential value of using video prompting to teach complex vocational tasks, additional studies are needed to validate the findings. First, experimental research is needed to systematically replicate current results. Second, the research should be conducted with individuals of varying ages and disabilities to determine the intervention's effects when implemented with different populations. Additionally, studies that generalize the findings to novel settings and skills will help to document the usefulness of video prompting in vocational settings.

While students in this study were able to complete one product in one setting, very few jobs require employees to complete only one task. Employees are expected to independently start a task and transition to the next task. Future studies should therefore examine the use of video prompting to transition employees from one complex vocational task to the next.

Employees with disabilities additionally need to be given opportunities to work with nondisabled peers in inclusive settings. The current study examined how students could be taught the complex skills that would make acquiring a job in an integrated setting more feasible. However, the data were collected at a special education school with other students who had disabilities. Future research should examine the effects of video prompting in an inclusive setting.

In the current study students were taught to use three tools and various woodworking procedures to make one product. Because the skills that participants acquired could potentially be used to make other novel products, future research should examine whether students with developmental disabilities can acquire a sequence of vocational behaviors after hearing a specific mand (e.g., drill a ¾ inch hole) and determine whether hearing the mand again with a novel task produces the desired behavior. In other words, studies demonstrating the generalization of skills to similar but novel tasks in the absence of video prompting or video modeling would be beneficial.

Summary

Previous research clearly indicates that video prompting can be an effective way to strengthen the skills of students with disabilities. This evidence-based tool has been used to promote the acquisition of a variety of skills, ranging from academic tasks to basic life competencies. Although further research is needed to validate current findings, results suggest that video prompting may be effectively used to teach complex vocational tasks, increase students' repertoire of employment skills, and better prepare them to enter the world of work.

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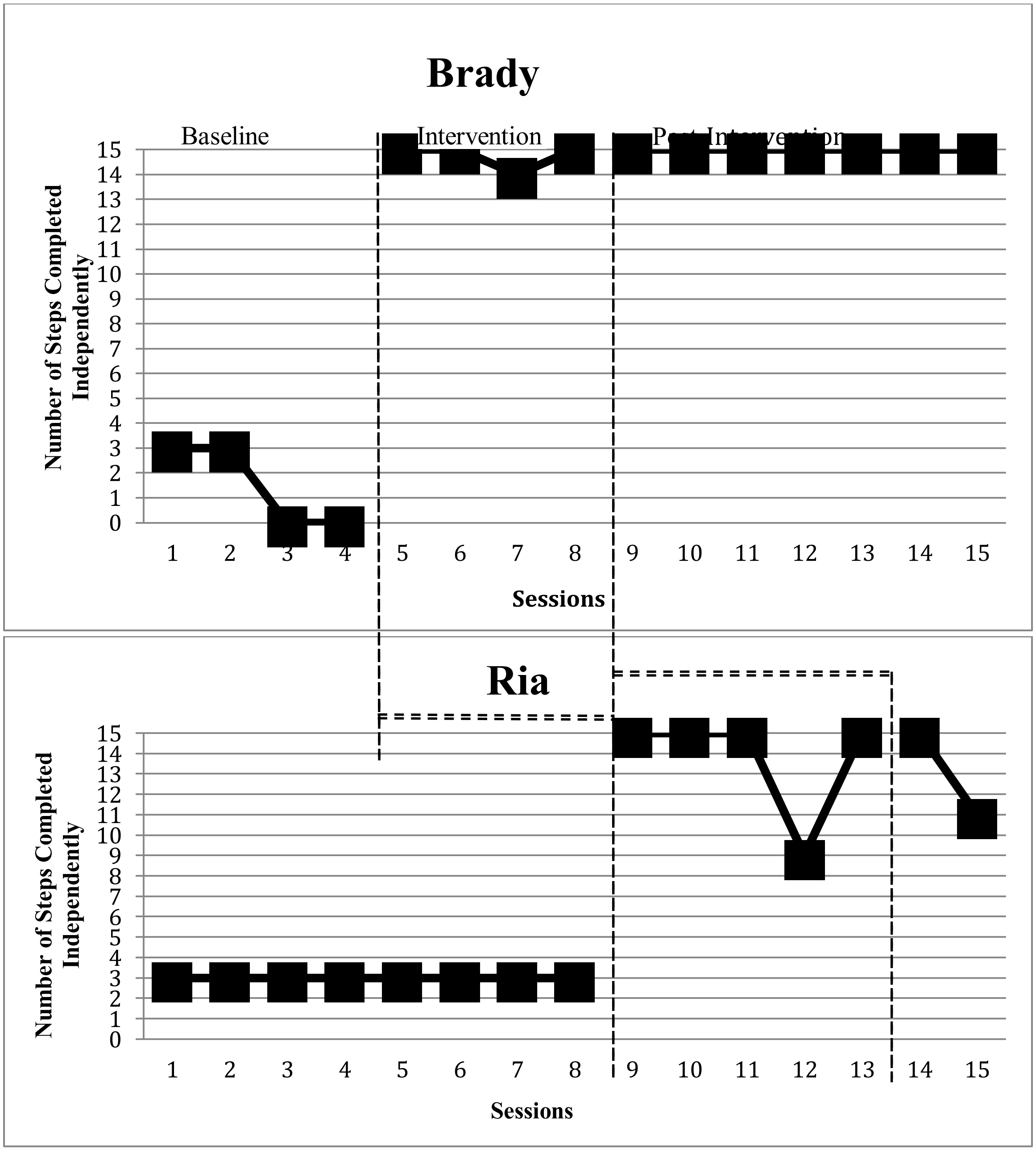

Figure 1. Independent task completion.

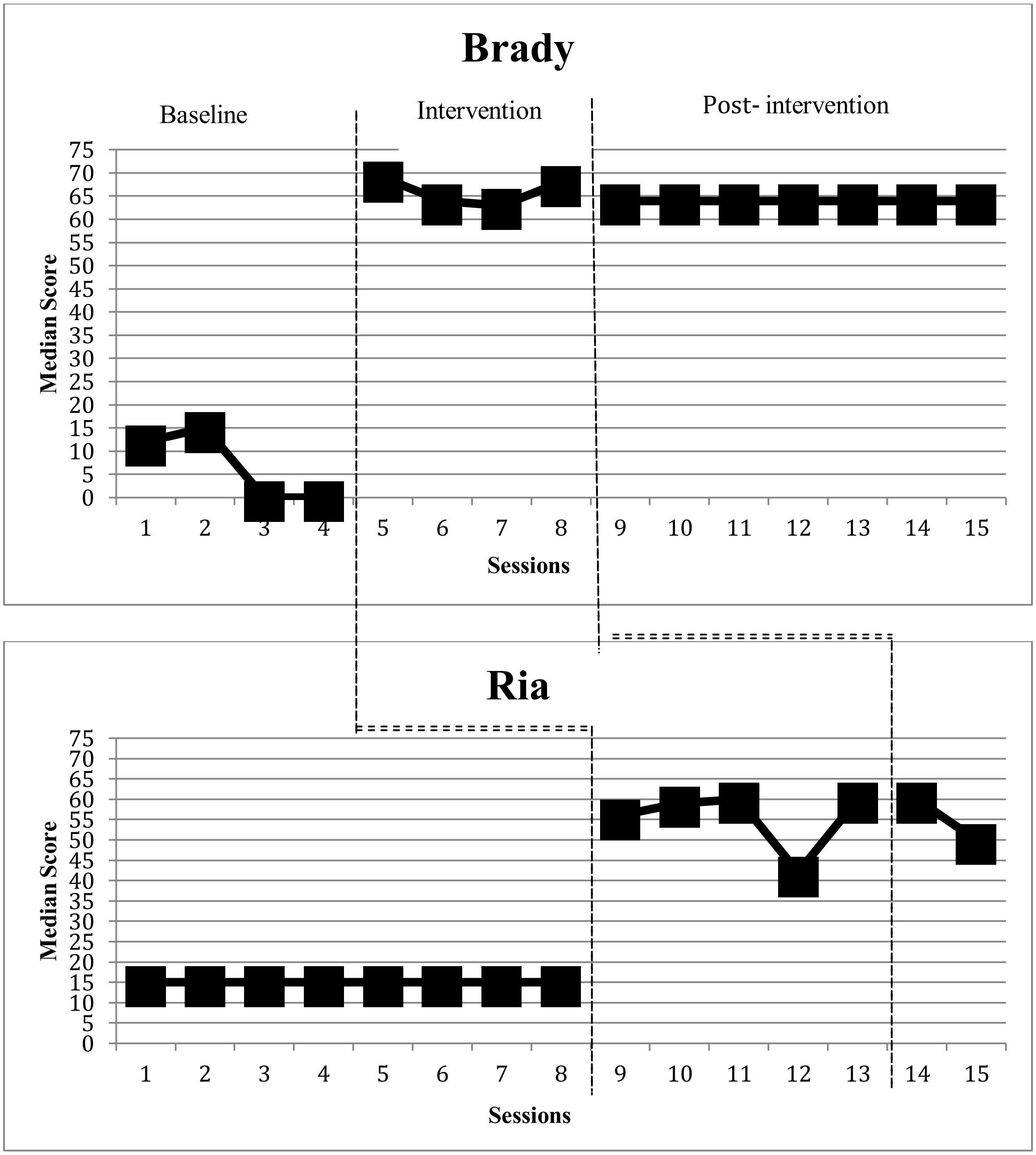

Figure 2. Quality check score.

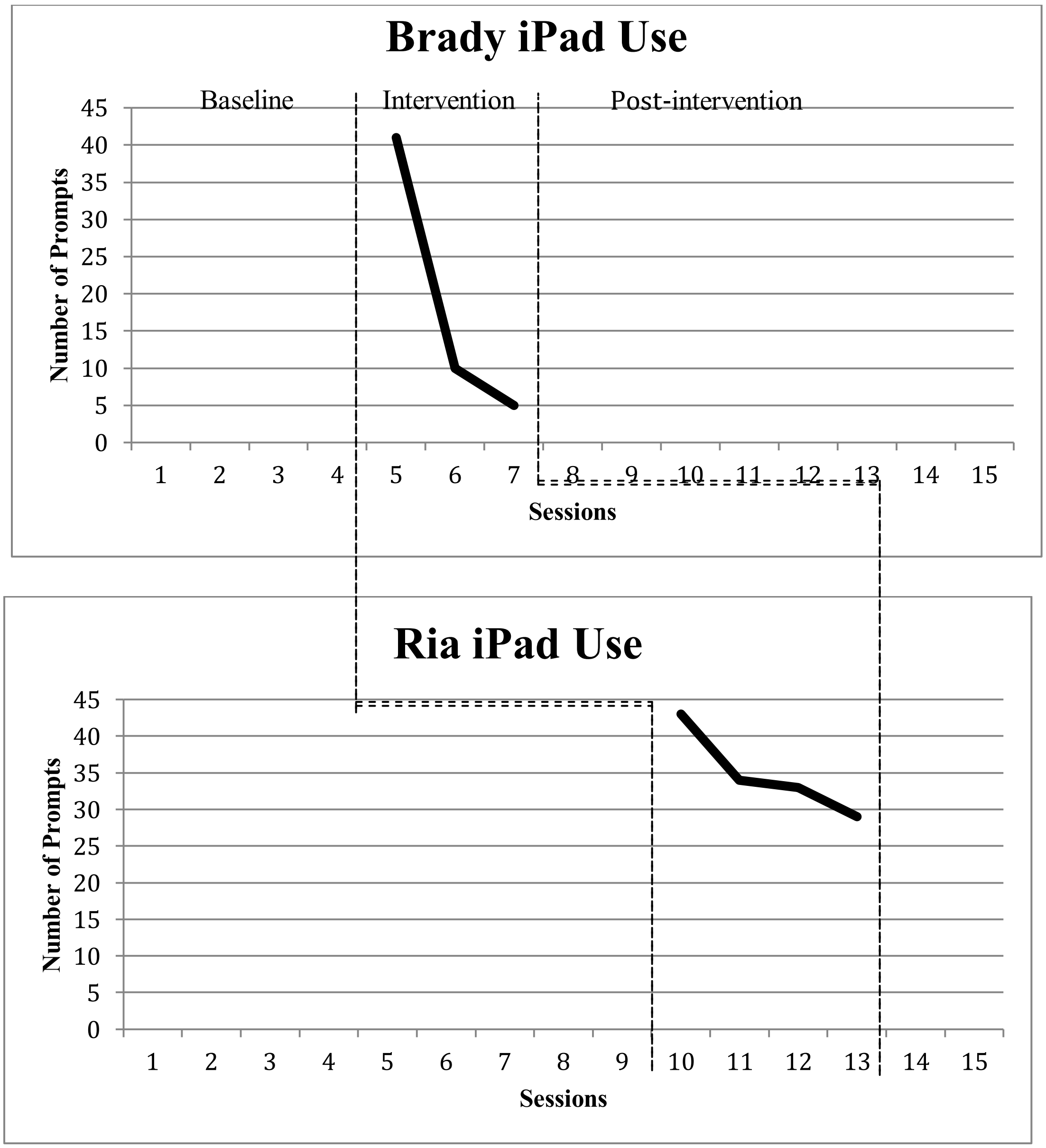

Figure 3. iPad prompting.

Appendix A

Literature Review

The purpose of this literature review is to highlight the issues related to the transition of secondary students with disabilities from school to work. Current laws state that students with disabilities are entitled to an Individualized Transition Plan (ITP) (White & Weiner, 2004) that is based on age appropriate assessments (Flexer & Luft, 2005), student preferences (Flexer & Baer, 2005; Mandlawitz, 2007; Morgan & Horrocks, 2011; Neubert, Moon, & Grigal, 2002; Stock, Davies, Secor, & Wehmeyer, 2003) and postsecondary goals (Kochar-Bryant, Shaw, & Izzo, 2007). Despite laws that have strived to increase post-school outcomes for students with disabilities, many are still facing problems. This is especially true for students with developmental disabilities (Baer, Daviso III, Flexer, Queen, & Meindl, 2011; Grigal, Hart, & Migliore, 2011; Smith & Stuart, 2002). Specifically, few students with developmental disabilities are employed in integrated settings. The majority of students who are classified as having severe developmental disabilities work in sheltered workshop settings, even though the research states that it will lead to fewer work opportunities (Stevens & Martin, 1999; Unger & Simmons, 2005; White & Weiner, 2004), skill development (Migliore, Mank, Grossi & Rogan, 2007; Stevens & Martin, 1999; Unger & Simmons, 2005), opportunities for self-advocacy (Grigal et al., 2011) and less pay (Migliore et al., 2007; Unger & Simmons, 2005) than an integrated work setting. In addition, few students with developmental disabilities take advantage of postsecondary educational opportunities (Hardman, Drew & Egan, 2011; Grigal et al., 2011). This can lead to lower satisfaction with their lives (Katsiyannis, Zhang, Woodruff, & Dixon, 2005). Students should be acquiring skills in high school that will increase their ability to take advantage of post-high school options, but few are doing so.

This literature review will also outline potential solutions to increase the transition options for students with developmental disabilities. These include a greater focus on person-centered planning (Hardman et al., 2011; Rasheed, Fore, & Miller, 2006; Smith & Stuart, 2002); job-matching, a way to match job preferences with potential skills (Estrada-Hernandez, Wadsworth, Nietupski, Warth, & Winslow, 2008; Kilsby & Beyer, 2002; Morgan, 2008); and supported employment, a way to provide students with disabilities an opportunity to work with their peers (Stevens & Martin, 1999; Unger & Simmons, 2005; Wehman, 2001). In addition, research-based strategies should be used when instructing transition-age students (Lancioni, O'Reilly, Seedhouse, Furniss, & Cunha, 2000; Mechling & Ortega-Hurndon, 2007; Test et al., 2009). Video technology is one way to effectively teach students necessary transition skills (Lancioni, Raimondi, & Giattaglia, 1989; Unger & Simmons, 2005; Wehmeyer, Palmer, Smith, Davies, & Stock, 2008). More specifically, video prompting is a particularly promising way to assist students in acquiring a wider range of complex skills that are needed for integrated employment and post-high school educational options (Mechling & Gustafson, 2008).

Legal Requirements for Transition

Many laws are in place to help students with disabilities transition from school to work including, the Americans with Disabilities Act of 1990, the Rehabilitation Act of 1973, and the Individuals with Disabilities Education Improvement Act (IDEIA) of 2004. These laws make discrimination against people with disabilities illegal. They also give financial aid to people with disabilities who are working and mandates quality transition programs.

Laws preceding IDEIA (2004). With the passage of Americans with Disabilities Act (ADA) in 1990, activities, services and programs were made accessible to people with disabilities. ADA legalizes access to employment, transportation and accommodations for qualifying individuals (Hardman et al., 2011). The law also makes providing accommodations for work tasks mandatory. This includes buildings, transportation, and communication. Furthermore, ADA prohibits employers from discriminating against employees with disabilities during job applications, hiring, discharge, compensation and raises (Flexer, 2005).

The Rehabilitation Act of 1973 helps people with disabilities gain access to programs that will aid them in their transition from school to work. These programs include transportation, family services, vocational training, interpreter services, counseling, and vocational evaluations through rehabilitation counselors (Hardman et al., 2011; Smith & Stuart, 2002). Just like ADA, the Rehabilitation Act of 1973 makes discrimination against people with disabilities illegal. Furthermore, the Act states that people with disabilities should be given the opportunity to make choices about their adult life (Flexer, 2005).

The passage of IDEA. Requirements for transition increased with the passing of IDEA. For example, the IDEA of 1997 made few transition requirements. The law stated that transition services need to be addressed when the student was 14 and that a transition plan needed to start at 16. The importance of outside agencies started emerging in the 1980s; however, this was the first time it was mandated to consider them in an

Individualized Education Plan (Kochar-Bryant et al., 2007). Even so, the law did not present guidelines regarding what transition topics should be addressed. Thus, a statement regarding inter-agencies participation in the student's transition from school to work was supposed to be included in their IEP. As IDEA has changed over the years transition requirements and positive transition outcomes have increased.

Current transition requirements under IDEIA 2004. Transition requirements were further strengthened with the reauthorization of IDEIA in 2004 (Grigal et al., 2011; Kochar-Bryant et al., 2007; White & Weiner, 2004). The current law mandates transition plans to be in place no later than the age of 16 (Hardman et al., 2011; Mandlawitz, 2007; Miller, Lombard & Corbey, 2007; Smith & Stuart, 2002). The law also gave teachers the option to begin transition planning earlier if they viewed it as being necessary. The purpose of the transition plan is to make education applicable for the student, involve the student in the process, and motivate students' to make relevant goals and objectives (Miller et al., 2007). Furthermore, IDEIA 2004 provided specific requirements about what should be included in a transition plan.

First, a transition plan needs to include age-appropriate assessments that give information related to education, employment, independent living skills, or training (Flexer & Luft, 2005). Transition assessments are assessments that provide information not available through traditional testing. This information might include worker characteristics, functional life skills (e.g., transportation, independent living skills), or technical/industrial skill assessments. In addition, transition plans need to include preference assessments (Flexer & Baer, 2005; Mandlawitz, 2007; Neubert et al., 2002). These assessments generate information about a student's preference with respect to work setting, learning preferences or vocational interests. Preference assessments are vital because they direct the services needed to help the student accomplish his/her goals (Kochar-Bryant et al., 2007; Mandlawitz, 2007; Morgan & Harrocks, 2011). IDEA 1997 stated that transition assessments needed to be based on a student's needs while taking into account their preferences. IDEIA 2004 clarified the need to focus on a student's strengths when administering assessments.

After age-appropriate assessments are completed, relevant goals need to be made. IDEIA 2004 was the first law making it mandatory to include postsecondary goals to be written regarding training, education, employment, and independent living skills. The current law also states that transition services present in the IEP need to help the student reach their goals (Kochar-Bryant et al., 2007).

Mandating quality transition programs. The School-to-Work Opportunities Act of 1994 is another law that sought to improve the quality of transition from school to work for disadvantaged students by emphasizing outcomes, career education, and post-school employment training (Flexer, 2005). The law increased state responsibility in a number of ways. First, it made states responsible for including programs or instruction that would help students gain the skills and knowledge they would need to transition from school to work. Second, it made states responsible for preparing youth for jobs that could then extend into a future career. Third, it required states to expand learning by integrating students into community activities. Fourth, state programs must combine academic and occupational learning during school so that students will have positive post-school outcomes (Flexer, 2005). In addition to mandating quality transition programs when a student is still in high school the School-to-Work Opportunities Act also provides education and training for employment and education after high school (Hardman et al., 2011). Even with the current transition laws in place, students with disabilities continue to experience negative post-school outcomes.

Current Issues among Youth in Transition

Problems still exist for students as they transition from school to adult life. Researchers have found that this is especially true for students with developmental disabilities (Grigal et al., 2011; Smith & Stuart, 2002). They often experience greater rates of high school failure and drop out, low employment rates, low participation in post-secondary education and lower satisfaction in their lives (Katsiyannis et al., 2005). According to Hardman, Drew, and Egan (2011), "three decades since its [IDEIA, 2004] passage, the educational opportunities afforded by this landmark legislation have not yet led to full participation of special education graduates in the social and economic mainstream of their local communities" (p. 84). For example, many students with developmental disabilities are placed in sheltered workshops instead of integrated employment. Research has shown that quality of life indicators are better for those who are engaged in integrated employment than those in sheltered workshops (Unger & Simmons, 2005).

Because students with developmental disabilities are often not taught skills needed for competitive employment, they are unprepared to assume a meaningful vocational role; thus, they experience high rates of unemployment after they leave high school (Grigal et al., 2011; Hardman et al., 2011; Migliore et al., 2007; Migliore, Grossi, Mank & Rogan, 2008). When students with developmental disabilities obtain a job after high school it is most likely, at best, a minimum paid job. Grigal, Hart, and Migliore

(2011) performed a secondary analysis of the National Longitudinal Transition Survey 2 (NLTS2, 2001). One of the purposes of the study was to examine the transition planning and post-school outcomes for students diagnosed with an intellectual disability compared to students of other disabilities (e.g., autism, deafness, blindness, emotional disturbance, behavior disorder, hearing impaired, learning disability, multiple disabilities, other health impairment, orthopedic impairment, speech impairment, visual impairment and traumatic brain injury). More than 11,000 secondary students with a disability were included as participants in the study. The longitudinal study surveyed parents/guardians, youth and teachers every two years for five years. Results indicated that 96% of people without disabilities were engaged in minimal paid jobs and 77% of students with disabilities were engaged in minimal pay jobs. Results likewise indicated that integrated work with minimal pay is not always an option for many students with severe disabilities due to the fact that they are often unable to initiate tasks independently, complete tasks independently or acquire complex skills that are needed in integrated employment.

History of Sheltered Workshops

As NLTS 2 (2001) findings clearly indicated many students with disabilities are not able to obtain a minimum paid job in an integrated setting; instead they work in sheltered workshops. Sheltered employment first began in the 1970s and was designed to provide a protective environment that would teach simple work skills (Unger & Simmons, 2005). Results of the study indicated (Grigal et al., 2011) that as many as 68.6% of students with developmental disabilities are working in a sheltered workshop setting.

While sheltered workshops provide work for students with disabilities, they provide little integration with non-disabled peers. Many students with developmental disabilities are being demoted into segregated settings that provide little opportunity for advancement into an integrated work setting (Grigal et al., 2011).

In addition, sheltered work settings provide few opportunities for students with disabilities to make choices or practice self-determination. Students are rarely asked what hours they want to work, when they would like a break, the setting they would like to work in or the activity they would like to do. Grigal, Hart, and Migliore (2011), found similar results in their study showing that students are not given opportunities to practice self-determination. They also found that employment goals made in an Individualized Transition Plan (ITP) that are directed at work in a sheltered setting predict a lower likelihood of obtaining integrated employment (Agran, Storey, & Krupp, 2010; Katsiyannis et al., 2005; White & Weiner, 2004) than goals targeting non-segregated placements.

Skills taught in sheltered work settings are not skills that can be transferred to an integrated work setting. In fact, because students were not hired, but instead placed there by caregivers or guardians they are not required to establish the same work skills as those in an integrated setting (Migliore et al., 2007; Unger & Simmons, 2005). It has been assumed that work in an integrated setting is too complex for students with disabilities (Mechling & Ortega-Hurndon, 2007). Thus, the skills taught in sheltered settings are extremely simple and repetitive (Migliore et al., 2007; Migliore et al., 2008). Furthermore, when students enter a workshop setting they rarely leave. One researcher even stated that students placed in segregated workshops are more likely to die of old age than enter an integrated setting (White & Weiner, 2004).

Unger and Simmons (2005) reported that students in sheltered work settings are not being offered similar economic advantages as their non-disabled peers in integrated work settings. Sheltered workshops provide little pay for students with disabilities. The majority of students earn less than minimum wage and are often paid on a piece-rate basis for their work. Migliore, Grossi, Mank, and Rogan (2008) assessed pay scales for students with disabilities in sheltered work settings and integrated work settings. They found that students who worked in a sheltered workshop earned $2.30 an hour, while students involved in an integrated job with support earned $5.75 an hour. In conclusion, sheltered workshops do not comply with laws suggesting that people with disabilities deserve to be trained and educated in the least restrictive environment (Migliore et al., 2007; Unger & Simmons, 2005).

Solutions for Negative Post-school Outcomes

Despite current trends regarding negative postsecondary outcomes for individuals with disabilities, a number of solutions are currently under investigation. These include high expectations among professionals, person-centered planning, job matching and supported employment.

Increased expectations. In order for students to succeed in integrated settings, professionals, parents, and students need to have high expectations. When professionals hold low expectations for people with disabilities, the general public had the tendency to take on the negative opinions as well (Wehman, 2001). In addition, when service providers and parents hold low expectations regarding what kind of work students are capable of, they will limit the student to entry, low skill level jobs. Researchers have found that low parental expectations lead to limited activities, exposure, and accomplishments. However, if parents have high expectations their children will experience and accomplish more (Grigal et al., 2011). Grigal noted that when students with disabilities have high expectations they are more likely to experience academic and career success. They asserted that, it is necessary for an Individualized Transition Plan (ITP) to recommend integrated, paid employment regardless of the severity of the individuals' disability.

Results of a study conducted by Estrada-Hernandez, Wadsworth, Nietupski, Warth, and Winslow (2008) regarding job preferences among 115 high school students with mild to severe disabilities indicated that students with severe disabilities often showed a preference for food service and similar entry level jobs that provided little income. They hypothesized that this was because few students had been given opportunities to experience other, more demanding jobs. The researchers further stated that people with disabilities should be given opportunities to try a variety of jobs, so that they will have high expectations of themselves. Because of the number of students who have negative post-school outcomes, low level jobs or no jobs at all, professionals are asking themselves whether transition goals are reflecting high expectations such as competitive employment or postsecondary school. In addition to having high expectations, service providers need to involve the student in preference assessments.

Person-centered planning. One way to ensure that a student's IEP is based on his or her interests and preferences is to use person-centered planning (Katsiyannis et al., 2005). Person-centered planning is a way to understand student's preferences regarding education, employment, independent living and recreation (Flexer, Simmons, Luft, & Baer, 2005; Menchetti & Garcia, 2003; Neubert et al., 2002). With regards to planning IEPs and making goals, it puts the student first and focuses on the student's strengths instead of their disability. According to Rasheed, Fore, and Miller (2006), the idea behind person-centered planning is that the student's preferences should guide their IEP. When it is used to develop an IEP, the student should not be expected to fit into a specific, predetermined program. Instead, assessments should be given to determine preferences, and those preferences should guide future goals (Hardman et al., 2011; Rasheed et al., 2006; Smith & Stuart, 2002).

When professionals are assessing a student's preference they need to use methods that will best reflect the student's choices. This is especially important for students with severe disabilities who may not be able to verbalize their preferences regarding education and employment (Guess, Benson, & Siegel-Causey, 2009; Morgan & Ellerd, 2005; Morgan, Morgan, Despain, & Vasquez, 2006; Parsons, Reid, Reynolds, & Bumgarner, 1990). Choice-making has been defined as a student indicating a preference when alternatives are given by engaging in choice making behaviors, such as verbalizations, gestures (e.g., touching or pointing to an augmentative and alternative communication device or icon) or physical selections (e.g., grabbing an object that signifies a preferred job) (Ellerd, Morgan, & Salzberg, 2006). According to Morgan (2008) and Ellerd et al., (2006), assessing students' preferences are required by law for transition age youth by IDEIA 2004 and the Rehabilitation Amendments Act of 1998. An important aspect of assessment is providing a variety of experiences from which an individual can choose.

In order for an assessment to be valid, students need to be given opportunities to sample a variety of experiences. According to Stock, Davies, Secore and Wehmeyer (2003) people with disabilities often have limited preferences and opinions about post-school options because they do not have a vast array of experiences. Determining preferences is often related to experiences the student has had; thus, it is important to provide students with a wide range of experiences prior to assessing their preferences (Estrada-Hernandez et al., 2008; Flexer et al., 2005; Morgan & Ellerd, 2005; Smith & Stuart, 2002). In addition to assessing educational preferences, it is important to assess vocational and employment preferences; this is known as person-centered job selection (Morgan et al., 2006; Reid, Parsons, & Green, 1998).

Person-centered job selection allows teachers and employers to learn the work preferences of a student with disabilities (Menchetti & Garcia, 2003; Stock et al., 2003). Research states that when a person-centered job selection approach is used students have a higher quality of life, their job performance improves and there is often a reduction of negative behaviors in the workplace (e.g., Agran & Krupp, 2011; Morgan, 2008; Morgan & Horrocks, 2011). Students may prefer a job that is beyond their current skill level. However, researchers have found that students are motivated to work and obtain the needed skills if they are working towards a preferred job (Morgan, 2008; Agran & Krupp, 2011). In addition, independent functioning often increases for students who have been given the opportunity to choose experiences in which they want to participate (Guess et al., 2009). Nevertheless, for simplicity sake, service providers and families are often quick to put a student in a job that fits their current skills and is determined by someone other than the student (Migliore et al., 2007; Rasheed et al., 2006).

Results of studies conducted in the United States and Great Britain show that a disproportionate number of people with disabilities are engaged in food service and cleaning jobs (Kilsby & Beyer, 2002; Morgan, Ellerd, Jensen & Taylor, 2000). A national survey of high school age students with disabilities also disclosed that a high number of students with disabilities were employed in food services (Morgan et al., 2000). According to Unger and Simmons (2005), "too often jobs for people with disabilities have centered on food service and cleaning jobs with little regard for matching skills and preferences with the requirements of the given job" (p. 379). While it may be easier and less time consuming to assign these jobs, doing so, is not in accordance to current laws. In addition, it is not putting the needs of the individual before the needs of the service provider. A solution to simply assigning jobs and hoping for success is to use person-centered job selection. This involves teaching the student skills they need to obtain and keep a job of their choosing. Essentially, "individuals with disabilities have the right to participate in or determine their long-term career planning with expectations far exceeding their current skill or job" (Morgan, 2008, p. 38). Instead of merely matching a student's current skills to a position that fits those skills, service providers should teach students skills they will need to access a job of their choice, even if the job is above their current level. Person-centered job selection seeks to identify and respect a students' potential, rather than their current ability.

Job matching. One way to help students with disabilities gain success in their preferred vocational choices is to job match. Job matching has been defined as "how well an individuals' cognitive abilities, interests, and personality traits match those required for success in a particular job" (Morgan, 2008, p. 29). Vocational and technical skills assessments can provide information about whether or not a student has the skills necessary to complete a job. In the past, job matching has been achieved by giving students examinations, such as Holland's Self Directed Test or Swenson's Job Match Pattern, in order to determine if a student has capabilities for a specific job. Morgan (2008) states that preferences should be assessed before capabilities. His assessment, the Your Employment Selection program (YES), begins by assessing a student's preferences for various work tasks and conditions. Then, it assesses how well the student can perform various aspects of the job. Lastly, a rating scale is used to rank job tasks with regards to importance. This process is important because it increases the likelihood that a student will succeed at his or her preferred employment and gain additional skills as demands increase (Agran & Krupp, 2011). Job matching will ultimately lead to successful employment and a higher quality of life. In fact, researchers have stated that job matching increases a sense of well-being, self-esteem and job satisfaction (Estrada-Hernandez et al., 2008; Kilsby & Beyer, 2002; Morgan, 2008; Morgan et al., 2006).

Morgan (2008) conducted a study in which 18 people with developmental disabilities aged 17 to 21 were evaluated to determine how well a job-matching program achieved its aim. His study used the YES program as a job preference assessment. The program required individuals to watch two to four minute clips that represented various work conditions. After students picked their preferred work conditions they watched 20 clips representing jobs in the preferred work setting (Morgan et al., 2006). A facilitator later rated each participant as good, fair, or poor with regards to the skills needed to perform the preferred job. Skills included time management, auditory attention, following directions, responding appropriately to correct, safety awareness, and so forth.

Each skill was given a rating as to its importance in the preferred job. For instance, some jobs require a student to have good writing skills. These jobs would rate “writing skills” with a high number to denote its importance. However, jobs that do not require writing skills would be denoted with a smaller number. According to Morgan’s results, the job-matching program was able to predict compatibility between current skill levels and preferred jobs (2008).

Researchers have asserted that discovering a job preference and teaching those skills the student will need may be a viable way to match their preferences to their abilities. They claim that looking at a student’s potential is a better way to job match than merely looking at current skills (Mechling & Ortega-Hurndon, 2007).

Supported employment. One solution to the problem faced by people with disabilities in sheltered workshops could be solved by providing them with supported employment. Supported employment attempts to integrate people with disabilities into mainstream work conditions by providing them with various supports so they succeed with the job demands (Lancioni et al., 2000; White & Weiner, 2004). According to the Rehabilitation Act Amendments of 1992, supported employment is “paid employment in integrated, real-work situations in which individuals are working toward competitive employment consistent with the strengths, resources, priorities, concerns, abilities, capabilities, interests and informed choice of the individuals with ongoing support services for individuals with the most significant disabilities” (Unger & Simmons, 2005, p. 365). Supported employment seeks to honor the preferences of individuals while incorporating them into society. Researchers have found that people who are engaged in supported employment have higher self-esteem, increased social acceptance and a higher quality of life than those who are not (Stevens & Martin, 1999).

In addition to higher wages, increased independence and more skill development, supported employment is more humane and respectful towards people with disabilities. The number of people engaged in supported employment has risen and is being used by many people with long-lasting disabilities; thus, proving that supported employment is continuing to work and give support throughout a person's life (Unger & Simmons, 2005; Wehman, 2001). A recent development in the field of supported employment is technology, which seeks to increase a student's independence by decreasing their dependence on other human supports (Unger & Simmons, 2005). Technology makes supported employment possible by providing assistance and opportunities so that an increased number of people can get and keeps jobs. A combination of the fore mentioned strategies, along with evidence-based practices will increase positive post-school outcomes, even for students who are classified as having developmental disabilities.

Using Research-Based Methods to Teach Vocational Skills

Using research-based methods to teach vocational skills is important. Congress has required schools to incorporate practices that are scientifically-based and grounded in research in their day to day instruction (Test et al., 2009). Teaching strategies that are research-based are going to provide the best education and post-school outcomes for students with disabilities. Specifically, they have the capacity to increase students' independence, help students quickly acquire a skill and improve the way they are viewed by society (Lancioni et al., 2000; Mechling & Ortega-Hurndon, 2007; Riffel et al., 2005; Smith & Stuart, 2002).

Research-based methods can help students with severe disabilities acquire skills that might normally be beyond their repertoire (Smith & Stuart, 2002). When students are given high-quality instruction they may be able to have more opportunities than might normally be available to them. Jobs that require high-level skills are not often given to people with disabilities. Instead, people with disabilities often receive low-level entry jobs. Professionals should be devoting their time to teaching strategies that will positively impact learning and independence (Mechling & Ortega-Hurndon, 2007).

Establishing efficient ways of providing vocational instruction to people with disabilities is important because it lessens the stigma that may be placed on them if they are constantly being supported by outside people (Stevens & Martin, 1999). If a student is able to acquire more complex skills they will be seen as capable individuals and may be offered more challenging work experiences and learning opportunities (Smith & Stuart, 2002). Much of the research has been dedicated to the investigation of prompting systems, because the method removes reliance on other professionals (Mechling & Stephens, 2009). Visual prompting systems, auditory prompting systems and a combination of visual and auditory prompting systems have been used to teach students with disabilities cooking (Mechling & Stephens, 2009), transportation (Carmien et al., 2005; Mechling & O'Brien, 2010) and prevocational skills (Lancioni et al., 1989; Steed & Lutzker, 1997).

Methods Involving the Use of Technology

Recent developments in the field of supported employment include the use of technology, which seeks to increase independence by decreasing the student's dependence on other human supports (Unger & Simmons, 2005). Technology makes supported employment possible by "unlocking doors and providing opportunities for a greater number of people to obtain and maintain employment" (p. 230). People with disabilities often lack skills necessary to complete various vocational tasks. Technology has been used to help students acquire skills, initiate tasks, complete complex tasks and independently perform job requirements (Furniss, 2001; Taber-Doughty et al., 2011). Research has shown that technology can be especially useful for students learning vocational skills and using those skills in a work setting. Instructing using technology helps people with disabilities learn more skills and increase their responsibilities in the workplace, which ultimately leads to a higher quality of life (Lancioni et al., 1989; Wehmeyer et al., 2008). Researchers have found that, when looking for appropriate assistive technology, it is important to identify the vocational goals the person would like achieve. Professionals need to determine a person's skills and interests before exploring assistive technologies (Inge, 2006; Gamble, Dowler, & Orslene, 2006). This goes hand-in-hand with the concept of person-centered planning. Once the person's interests have been determined it is helpful to look at various technologies that will help the student achieve his or her vocational goals. The use of technology in the workplace started with simple low-tech devices, such as static pictures and has moved towards more high-tech devices, such as computer-based video instruction or gaming devices.

Visual prompting systems. Visual prompting systems are visual prompts that come in the form of static pictures that guide a student through a particular task (Alberto, Cihak & Gama, 2005). Static picture prompts have been used to guide students through multi-step tasks, transition between different tasks and complete a multi-step task (Kilsby & Beyer, 2002; Mechling & Gustafson, 2008). Using pictures to direct a student can be in the form of pictures pasted into a booklet or pictures on a computer. Both systems have been used to teach various skills to people with disabilities.

Picture prompting systems. Picture prompting systems located in a book typically require a student to look at a picture, perform the task depicted, cross off the picture when they have completed the task and move on to the next task (Banda, Dogoe & Matuszny, 2011; Mechling & Stephens, 2009). Mechling and Stephens (2009) used picture prompts in a booklet to teach four young adults with intellectual disabilities to make hot chocolate, ravioli, broccoli and chocolate pudding. Steed and Lutzker (1997) used picture prompts with Mark, a 40-year-old male with profound developmental disabilities, to complete vocational tasks independently. The intervention consisted of a booklet that contained one picture prompt per page. Data were collected to determine his ability to independently perform each step. The book needed to be opened during the performance of each task to ensure that the participant was using the picture to guide task completion. Results indicated that Mark was able to complete more than 87% of steps with the use of the booklet. In addition, he was able to generalize the skill of using picture prompts to a new task. While picture prompts have been used as a prompting system for people with disabilities, the method may not be the most effective choice. The use of symbols or pictures to represent an action is not always understood by people with developmental disabilities. In addition, many people with disabilities have poor motor control, which can make it difficult for them to manipulate pictures or booklets. Picture prompts that are contained on a computer may help students who are unable to manipulate picture cards (Lancioni & O'Reilly, 2001).

Picture prompting systems on a computer. Some picture prompting systems provide pictures on a computer screen (Lancioni et al., 1989). Lancioni et al. (1989) used pictures to help three students with intellectual disabilities, vision and hearing problems to perform simple vocational tasks (i.e., putting away clothes, piling paper cups or putting items in containers). The program consisted of a slide projector that displayed a picture indicating the task to be performed. A mat with a sensor was used to change the slide when the student stepped on it. Results showed that two of the three participants demonstrated high levels of correct responding when the technology was used, and their ability to independently engage in the task also increased (Lancioni et al., 1989). The results show that pictures can be effectively used to guide students with disabilities through a sequence of steps in order to complete a task.

Picture systems have been used as a way to help people with disabilities increase their vocational responsibility by acquiring skills and learning new tasks at a job site. A stock company in Sweden employed 20 people with intellectual disabilities. The participants learned to use a color-coded picture system to identify two categories of stocks. The categories to be identified included (a) stocks that were available and (b) stocks that had already been shipped. The purpose of the training was to help employees learn to handle stock and order new inventory. The assistive technology focused on the use of pictures and colors. Stocks that were currently available for sale were yellow. Stocks that had already been shipped out were grey. The color-coded system helped employees identify the stocks that needed to be ordered and to determine when to order them. In the supply room in which the stocks were located, each container was labeled with a picture so the employees could determine its contents. Researchers found that the picture system helped employees in numerous ways; the quality of their work, raised their self-esteem, and taught them to assume responsibility for new tasks (Barkvik & Martensson, 1998). The results of the study indicated that the use of picture prompts can help people with disabilities perform a wider variety of tasks independently and correctly.

The use of a picture prompting system contained in a computer may help alleviate the need for students to manipulate pictures on cards. However, the problem still remains that student's needs to interpret the picture or symbol to mean a certain action (Lancioni & O'Reilly, 2001; Morgan, Ellerd, Gerity, 2000; Morgan et al., 2006; Stock et al., 2003).

Auditory prompting systems. Auditory prompting systems are systems that provide only verbal prompts to a student (Mechling, 2011; Riffel et al., 2005). They have been shown to decrease the need for outside prompts from a teacher or other service provider, and thus increase the independence of the student. Mitchell, Schuster, Collins and Gassaway (2000) used a set of headphones and a tape player to provide verbal prompts to three 14 to16 year old students when teaching them how to clean a mirror (consisting of six steps), clean a sink (consisting of seven steps) and clean a toilet (consisting of 10 steps). During the intervention phase each participant was required to turn on the cassette player, listen to the first step, turn the cassette player off when they heard a "beep" and perform the task until all steps were completed. Researchers collected data on the number of steps that were completed without the use of teacher prompts. During baseline all three students completed 0% of the steps independently. During the intervention phase, the students' ability to complete tasks independently increased to 86% (Lynn), 91% (Yvonne) and 91% (Doug). Students were also able to generalize their ability to perform these tasks in novel settings with 100% accuracy over 3 days.

Using auditory prompting systems has been found to be a more portable system than picture cards. However, the system is not the most effective way to teach students who have poor receptive skills. In order to understand the directions provided, students need to be able to discriminate relevant vocabulary, decode words and comprehend the meaning of the words presented (Lancioni & O'Reilly, 2001). One way to solve the problems present in an auditory prompting system is to use a video prompting system that combines picture and auditory cues.

Visual and auditory prompting systems. A combination of visual and auditory prompting has been shown to be extremely effective (Van Laarhoven, Zurita, Johnson, Grider, & Grider, 2009). Visual and auditory prompting systems have been used in the form of handheld computer devices, computer-based technology, gaming devices, video modeling and video prompting.

Video modeling. Video modeling interventions require a student to watch a specific behavior being demonstrated in a video, after which the student is expected to imitate the model (Banda et al.; 2011; Bellini, 2007; Van Laarhoven et al., 2009; Van Laarhoven & Laarhoven-Myers, 2006; Van Laarhoven, Laarhoven-Myers & Zurita, 2007). When students are taught a skill using the video modeling technique, they are shown a model of the entire skill (Alberto et al.; 2005; Van Laarhoven & Van Laarhoven-Myers, 2006). Because the sequence of tasks is watched in its entirety, the video usually lasts a couple of minutes (Alberto et al., 2005; Cannella-Malone et al., 2006; Cihak, Fahrenkrog, Ayres, & Smith, 2010; Dowrick, 1999). One study used video technology to teach three 17 to 22-year olds to manipulate an inflated mascot in a store (Allen, Wallace, Greene, Bowen, & Burke, 2010). The videos showed participants how to move the mascot in order to perform various actions, such as waving or blinking. Results of the study showed that the video intervention increased students' ability to manipulate the mascot in an integrated setting. In addition, participants maintained skills and were able to generalize their skills to other mascots.

Video prompting systems. A video prompting system is a type of technology that uses a combination of pictorial and auditory cues in the form of a video to provide instruction to people with disabilities (Alberto et al., 2005; Le Grice & Blampied, 1994; Mechling, 2005). Video technology has been used to teach skills that are complex and has shown to be effective in a number of cases. Sigafoos et al. (2007) taught three adult men with developmental disabilities to wash dishes using video prompting. During baseline no video was used, and the student was given the direction, "Can you wash the dishes?" The intervention consisted of a video prompt of the first step in the task analysis. After watching the video, the participants performed the first step. This pattern was followed until all steps of the task analysis had viewed and attempted. Results showed that one participant (Ray) was only able to complete 10% of steps independently during baseline. After nine sessions of the intervention he was able to perform 100% of the steps independently. A second participant (John) was able to complete 20-30% of steps independently during baseline. After the intervention was introduced he was able to perform 100% of steps independently. The third participant (Curt) initially performed 10% of steps independently with a gradual trend to 60% and then a decrease to 40% during baseline. Curt was able to perform 90% of steps independently immediately after the video prompting intervention was introduced. Results showed that video prompting is an effective way to teach skills to students with developmental disabilities.

Handheld computer prompting systems. A handheld computer system includes picture prompts, auditory prompts or video prompts that guide a student through tasks. Handheld systems are often preferred to picture booklets or systems on a computer because the devices are more compact, portable, socially acceptable and preferred by students (Cihak, Kessler & Alberto, 2007). Mechling (2011) performed a literature review on the types of handheld computer prompting systems that are being used by people with disabilities. She found that students are using anything from cell phones and ebooks to global positions systems (GPS) and personalized media, such as MP3 players. Some studies have shown that students are better able to complete tasks when a handheld computer device is used (Furniss, 2001). Furniss (2001) used a palmtop computer (VICAID) to teach a 47-year-old man with developmental disabilities to put together a valve. The VICAID system included a button that, when pushed, showed a pictures of each step needed to perform the task and a timer to make sure the participant was on task. The participant needed to complete 26 steps in order to successfully assemble the valve. When the VICAID system was used the participant was able to maintain high levels of accuracy and was even able to do so when the system was removed. His ability to maintain attention to the task increased as well. Replication studies have shown that the system was especially useful for people with attention difficulties. The studies have indicated that individuals who use the system perform tasks with higher rates of accuracy compared to using pictures in books (Furniss, 2001).

Lancioni, O'Reilly, Seedhouse, Furniss and Cunha (2000) found handheld computers to be effective when teaching six adults (from 23 to 47 years old) with severe intellectual disabilities to complete cleaning and food preparation tasks. During baseline all six participants had low levels of independent and accurate task completion. However, when a handheld computer was used during the intervention phase, four students had a mean of 90% correct responses and two students had a mean of 65%. These studies show that handheld devices can be used to teach vocational skills to people with disabilities. When teaching complex skills that students need to perform in a community setting, it is often beneficial for them to practice a skill. Studies have found that using computer based technology to provide instruction and practice before they are actually required to do the skill increases successful task acquisition and completion (Langone, Clees, Rieber, & Matzko, 2003; Mechling & O'Brien, 2010).

Computer-based technology. Computer-based technology can be used to instruct students in a simulated community. Time and staff are often limited when it comes to teaching students community skills. Computer-based technology has students practice the skill on the computer before they practice it in real life (Hansen & Morgan, 2008; Langone et al., 2003; Mechling, 2005; Mechling & O'Brien, 2010; Mechling & Ortega-Hurndon, 2007). One type of computer-based technology being used in classrooms is computer-based video instruction (CBVI). CBVI has been used to teach students with disabilities skills they will need to perform in a community setting. For instance, Mechling and O'Brien (2010) used CBVI to teach three students with intellectual disabilities to use public bus transportation. The CBVI consisted of filming the steps for riding a bus. During the intervention, students watched video clips of various steps and were then asked to click on landmarks that were pertinent to their destination. Results showed that students were able to generalize what they learned using CBVI to real-life settings.

Ayres, Maguire, and McClimmon (2009) used computer-based technology to teach three elementary school-aged students to perform daily living tasks such as, setting the table, making soup and making a sandwich. During the intervention, students were required to watch a video depicting one of the skills. Then the student used the mouse to do the same thing on the computer. For instance, the student would watch a video of someone setting a table. Then, the student would use the mouse to drag the utensils and dishes in the correct format on the computer screen. Results showed the computer-based instruction was one way to increase a student's ability to acquire a skill.

Gaming devices. A gaming device is a combination of an Xbox 360 and a webcam, which allows participants to interact with the device using gestures and movements. Some gaming devices are able to receive input from the participant's entire body. In addition, they are able to give prompts and corrections based on the participants movements. If the step is performed correctly the gaming device will show the next step. If the task was not completed correctly it will show the step again (Chang, Chen & Chuang, 2011). Carmien, Dawe, Fischer, Gorman, Kintsch and Sullivan Jr. (2005), developed a Personal Travel Assistant to provide pictorial and audio cues to instruct people with disabilities to use public transportation. According to interviews given to service providers who train people with disabilities to use public transportation only 45% to 75% of students will learn to use a single unsupervised bus route. This training can take from one to three years and is often costly. Because of the uncertainties of public transportation caregivers often choose to drive people with disabilities to desired locations even after they have had training. The Personal Travel Assistant is a wireless, mobile system with GPS technology. It generates prompts for students to board a bus, pull the stop cord to indicate the need to get off, pick up belongings and get off the bus. The device also keeps track of mistakes that may occur and will prompt the student what to do next. Using public transportation can be a complex process, especially for students with developmental disabilities. With the help of prompting, people with disabilities are able to participate in these complex tasks.

Recent advances in technology have made assistive devices for people with disabilities that do not need to be carried by the individual and that can send messages to other computers. These new devices increase a student's independence in the workplace. One such is example is known as the Kinempt (Chang et al., 2011). The Kinempt is able to read gestures made by students in order to determine if they are performing a task correctly. When a task is performed correctly, a new task is automatically shown on the screen. If the task is performed incorrectly, it is shown again. This system is a hands free system and helps reduce the need for constant one-on-one support from a job coach. Chang, Chen and Chuang (2011) recently performed an analysis of the Kinempt program in a simulated pizza store. Two adults with various mental disabilities were taught to make pizzas. Baseline data for one participant (Alice) averaged 28%. However, after the intervention using the Kinempt system, Alice was able to perform the task with an average of 96% accuracy. A second student, Ben, averaged 56% accuracy during baseline. Following the intervention he was working independently at 100% accuracy.

The researchers concluded that gaming devices may increase vocational skill acquisition for students with mental disabilities.

Skills taught using video modeling. Video modeling instruction involves videotaping a skill being performed. The student is expected to watch the entre skill and then subsequently perform it. There are three types of models that can be used in the intervention: self-model, peer model and subjective model. A self model uses the participant as the model, a peer model uses a same age and gender peer as the model and subjective uses a person's hands and arms as the model (Van Laarhoven et al., 2009). Various types of video modeling have been used to increase skills acquisition for students with disabilities. Video modeling has been used to teach a variety of skills to people with disabilities. These include social skills (Bellini, Akullian, & Hopf, 2007; Maione & Mirenda, 2006; Sherer et al., 2001), behavior skills (Buggey, 2005; Clare, Jenson, Kehle, & Bray, 2000; Schreibman, Whalen, & Stahmer, 2000), daily living skills (Alberto et al., 2005; Shipley-Benamou, Lutzker, & Taubman, 2002) language skills, vocational skills (Cihak & Schrader, 2008), and academic skills (Hitchcock, Prater, & Dowrick, 2004).

Video prompting. Video prompting may be a better option for students with developmental disabilities because the video clips are shorter than those used in video modeling (Alberto et al., 2005; Banda et al., 2011; Mechling, 2005; Mechling 2011; Mechling & Gustafson, 2008; Mechling & Stephens, 2009; Van Laarhoven & Van Laarhoven-Myers, 2006) and students are not required to remember all steps in order to complete a task correctly (Alberto et al., 2005; Cannella-Malone et al., 2006; Mechling, 2005; National Professional Development Center on Autism Spectrum Disorders, 2010; Van Laarhoven et al., 2009). The following is a detailed description of video prompting and why this intervention may be a more viable option than video modeling for students with developmental disabilities.

Description of video prompting. Video prompting clips are shorter than video modeling clips. Video prompting clips usually last a number of seconds (Banda et al., 2011; Cannella-Malone et al., 2006; Le Grice & Blampied, 1994), because the video is broken down into each step of the task. Cannella-Malone et al. (2006) compared video prompting to video modeling when teaching daily living skills to six adults with developmental disabilities. Teaching students to set a table using video prompting consisted of ten separate steps. Each step lasted 10 to 17 seconds. The program for unloading groceries using video prompting consisted of ten separate steps. Each step lasted 12 to 42 seconds. Mechling and Gustafson (2008) taught cooking skills to students with autism using video prompting. Because only one skill was shown at a time, each video clip lasted from 12 to 15 seconds. The examples illustrate a primary difference between video prompting and video modeling, specifically that video prompting clips tend to be much shorter than video modeling clips.

Completing a task analyzed skill sequence using video prompting. During video prompting, the student is required to watch a short clip portraying a single step from a task-analyzed sequence (Van Laarhoven et al., 2009). After the student watches the clip, he/she is expected to immediately perform the action shown (Cannella-Malone et al., 2006; Mechling, 2005; Mechling & Stephens, 2009; Van Laarhoven et al., 2009; Van Laarhoven &Van Laarhoven-Myers, 2006). For instance, Mechling and Stephens (2009) used video prompting to teach students to make ravioli. The steps for completing the task were as follows:

1. Insert finger in lid tab.
2. Lift up to remove the lid from the can.
3. Pour the ravioli into a pot.
4. Put the lid in a trash can.
5. Turn the stove on to medium.
6. Stir the ravioli.
7. Wait till the ravioli starts to bubble.
8. When this happens turn the stove dial to off.
9. Pour the ravioli into a bowl.
10. Eat.

During the video prompting intervention a student watched a subjective video clip of a model's hands inserting a finger into the lid tab. After the student finished watching the video, he pushed the pause button and performed step one. After step one was performed correctly, the student watched the video clip of the model lifting the tab to remove the lid. Then he performed step number two. Other steps were completed in a similar fashion (Mechling & Stephens, 2009). Riffel et al., (2005) conducted a comparable study in which students with severe disabilities were taught to perform various vocational tasks. Tasks in this study included four to sixteen steps. During intervention, students watched one step being performed, pushed "pause" at the end of the video clip, performed the task, and pushed a button that said, "done" to indicate they were ready to view the next step. Davies, Stock, and Wehmeyer (2002) used a similar methodology to teach students with intellectual disabilities two different vocational tasks, assembling a pizza box and packaging software. Participants watched a video clip showing a single step; after they completed the step they pushed the “done” button and pushed a button labeled “play” when they were ready to move to the next step in the sequence of skills.

When students imitate the step correctly, they are shown the next step in the sequence. If students do not perform the step correctly, a method of error correction is used (Alberto et al., 2005; Cannella-Malone et al., 2006; Le Grice & Blampied, 1994)

Advantages of using video prompting. Video technologies have been used to support people with disabilities in a wide range of activities (Alberto et al., 2005; Chang et al., 2011; Mechling, 2007; Parsons, Reid, Green & Browning, 2001). There may be times when one specific type of technology would be more beneficial than another. According to Sigafoos et al. (2005), some people with disabilities may experience better outcomes and may learn better from a video prompting device.

Prompts in the form of pictures, audio or videos are preferable to some people, because they may increase a student’s self-reliance. Furthermore, picture/audio and video prompts are similar to techniques that typically developing people use (e.g., planners, iPod, iPad, or cell phone) in their daily lives (Spriggs, Gast & Ayres, 2007). Students with disabilities often require assistance or prompts to complete simple or complex tasks independently (Chang et al., 2011; Mechling, 2007; Le Grice & Blampied, 1994; Mechling, 2005; Mechling, 2007; Parsons et al., 2001; Van Laarhoven & Van Laarhoven-Myers, 2006). Using a prompt is ethical and may be necessary for these students because it helps them perform the target skill. Carmien et al., (2005) explained that prompts are a form of distributed cognition, meaning that assistance and prompts can be used to increase the capabilities of students with disabilities. They further stated that prompts help to increase a person's physical and mental capabilities in order to complete more complex tasks.

Video prompting for complex tasks. Video prompting may be a better option for students when the task is complex and involves numerous steps (Davies, Stock & Wehmeyer, 2003; Le Grice & Blampied, 1994; Mechling, 2007; Mechling & Gustafson, 2008; Mechling & Stephens, 2009). It can be difficult for students with disabilities to remember all the steps needed to complete a specific task. Thus, several studies have shown how video prompting can be used to guide students through the sequence of steps (Carmien, et al., 2005; Chang et al., 2011). For instance, a study conducted by Mechling and Stephens (2009) used video prompting to teach four young adults with intellectual disabilities to cook hot chocolate, ravioli, broccoli and chocolate pudding. Baseline data were taken by recording the number of steps completed correctly and independently without the use of a prompting system. During the video prompting intervention, students watched a clip of the first step needed to complete the necessary cooking task, pushed pause, completed the step and then viewed the next step. Data showed that during baseline students were only able to perform between 0% and 30% of steps correctly. When using the video prompting system, students were able to perform 90.8% of steps correctly. Mechling and Stephens found that video prompting is a beneficial way to teach students with disabilities a complex task that involves multiple steps.

Cannella-Malone et al. (2006) performed a similar study when they taught six students with developmental disabilities to perform daily living tasks, such as setting a table and putting away groceries. Both tasks consisted of ten steps. They proposed that "video prompting might result in faster acquisition, at least when teaching multicomponent tasks" (p. 345). Data confirmed their hypothesis. One student was able to achieve 100% accuracy on putting away groceries when video prompting was used to teach the ten-step skill. A second student showed gains in his ability to complete steps correctly when video prompting was used to teach him to set the table. A third student rapidly acquired 100% accuracy on skills needed to set a table when the video prompting intervention was used. Similarly, a fourth student showed gains in her ability to perform multiple steps when video prompting was used. Two additional students (Steve and John) achieved 100% accuracy when video prompting was used to teach them daily living skills.

Le Grice and Blampied (1994) used video prompting to teach two students with intellectual disabilities to operate a video camera and a computer. Each task involved 20 steps. Due to the complexity of the skill and the number of tasks required to complete the skill, video prompting was used as an intervention. Results for the operation of the video recorder showed that during baseline one student was unable to perform any tasks correctly, and one student was able to perform five steps correctly and on only one occasion. However, after the video prompting intervention students were able to perform the task with 100% accuracy and accuracy was maintained over a period of one to two weeks later. During baseline testing for computer use, both students achieved 0% accuracy. However, following video prompting, students were able to acquire the necessary skills quickly.

The skills taught in this study were complex in nature and required students to locate and operate specific equipment correctly. The specific steps involved in operating a computer consisted of several steps-

Starting up the Computer

1. Switching the wall switch on
2. Choosing a disk
3. Sitting on the chair
4. Putting their fingers on the yellow spot on a disk in order to remove it correctly in step 5
5. Removing the disk from the packet
6. Putting the disk packet down
7. Pushing the disc into the left-hand drive
8. Closing the disk drive
9. Switching the computer on
10. Switching the monitor on
11. Pushing any computer key
12. Using the program

Turning off the computer

13. Switching the monitor off
14. Turning the computer power button off
15. Opening the disk drive
16. Putting thumb on the yellow post on the disk
17. Removing the disk
18. Putting the disk in its plastic cover
19. Turning the wall switch off
20. Putting the disk on the shelf

Video prompting for students with attention difficulties. Video prompting may be a better choice with certain populations because it does not demand long periods of attention when teaching a skill (Banda et al., 2011). In essence, a short video clip requires less attentional demands on the part of the student, and thus may be more effective (Chang et al., 2011; McCoy & Hermansen, 2007; Sigafoos et al., 2005). Cannella-Malone et al., (2006), performed a study comparing video prompting to video modeling when teaching daily living skills. They found the students involved in the study were able to pay attention better to the short clips used in the video prompting intervention. When video modeling was used, students were distracted and often looked away from the screen. The authors hypothesized that video modeling requires students to watch a long clip, creating more demands on their time (Cannella-Malone et al., 2006); thus, video prompting may be a more effective intervention than video modeling for students who experience difficulties in attending to a task.

Sigafoos et al. (2005) obtained similar findings in a study that used video prompting to teach three adults with developmental disabilities to cook popcorn in a microwave. During baseline, the first student (Bob) completed 20-30% of steps correctly. During the intervention phase, he completed 100% of steps correctly. A second student, (Jim) completed 0% to 20% of steps correctly during baseline and 100% of steps correctly during the intervention phase. Jim similarly performed 0% to 10% of steps correctly during baseline and 80% of steps correctly during intervention. On the basis of these results, the authors concluded that, video prompting may be a critical intervention for this population. Due to the extent of the participants' disabilities, the authors felt that video prompting was a critical factor relating to their success.

Observations showed that students “remained oriented to the computer screen” and “intently watched each clip from start to finish” (p. 199). Being able to attend to the film increased the likelihood that the student would complete the skill correctly.

Video prompting for students with retention problems. Video prompting may be a viable option for students who have a hard time retaining the information they have learned (Banda et al., 2011; Carmien et al., 2005). However, students need to be able to imitate what is on a screen before they can be expected to learn from a prompting device (Le Grice & Blampied, 1994). Research indicates that students who struggle with imitation may have more success when the skill they are required to imitate is a single step (Cannella-Malone et al., 2006; Cihak & Schrader, 2008; Sigafoos et al., 2006).

Results of studies investigating the use of video prompting suggest that students often perform a skill exactly as it was presented in the video when video prompting is used to teach the skill (Cannella-Malone et al., 2006; Sigafoos et al., 2006). For example, Sigafoos et al. (2005) taught three adults with developmental disabilities to cook microwave popcorn using video prompting. The researchers noted that each of the participants grasped the bag of popcorn to open it in exactly the same way as was shown in the video prompting intervention. In addition, they found that students performed skills at the same pace as the tasks were presented in the video.

Cannella-Malone et al. (2006) reported similar findings in a study in which video prompting was used to teach daily living skills to adults with developmental disabilities. The researchers found that students performed the skill exactly as it was shown in the video. They hypothesized that students were able to remember small detail present in the video.

Video prompting and independence. Video prompting increases a students' independence. In order for students with disabilities to function in their community, they need to move away from reliance on other individuals. Natural supports such as caregivers or service providers can be helpful to students. However, service providers become a hindrance when the student relies completely on them for prompts. Researchers explain that helping students to prompt themselves using picture/audio devices increases their level of independence (Carmien et al., 2005; Chang et al., 2011; Cihak et al., 2007; Davies, Stock & Wehmeyer, 2002; Mechling, 2007; Parsons et al., 2001; Sigafoos et al., 2005; Steed & Lutzker, 1997; Van Laarhoven & Van Laarhoven-Myers, 2006). In addition, a video prompting system decreases a student's need for constant supervision from another person by providing an alternative method (Mechling 2007; Steed & Lutzker, 1997). Studies have shown that independent performance of tasks increase when a verbal and visual prompting system is used.

Many video prompting interventions require the student to control the system (Davies et al., 2002; Mechling, 2007). Mechling (2007) found that video prompting systems that required the student to operate the device were successful in teaching students to perform a specific set of skills. Davies, Stock, and Wehmeyer (2002) used a video prompting handheld device to teach ten students with developmental disabilities to perform vocational tasks (assembling a pizza box and packaging software materials). During the video prompting intervention, students were required to watch the clip, push a button on the screen indicating "done", perform the task and then push a button on the screen indicating "play" prior to moving on to the next step. This system allowed the user to perform the steps at his/her own pace.

Teaching Vocational Tasks to People with Developmental Disabilities

Flexer, Simmons, Luft, and Baer (2005) defined vocational skills as programs that teach and instruct students to perform skills related to a specific occupation. Wehman (2001) further emphasized that vocational skills are skills related to employment or some type of advancement towards a given career. The following studies describe current literature related to teaching vocational skills to students with severe disabilities.

In 2000, Mitchell, Schuster, Collins, and Gassaway taught three students (ages 14-16) to clean a mirror, sink and toilet. However, instead of using video prompting, they used picture and auditory prompts. Davies, Stock, and Wehmeyer (2002) taught ten 18 to 21 year-olds to assemble pizza boxes and package software. They also used picture and auditory prompts. Van Laarhoven and Van Laarhoven-Myers (2006) used video prompting to teach three students with developmental disabilities to fold laundry, cook a microwave pizza and wash a table. The researchers defined the skills they taught as "daily living skills." Cannella-Malone et al. (2006) used video prompting to teach six adults with developmental disabilities to unload groceries and set a table. The title also used the word "daily living skills." Cihak, Kessler, and Alberto (2007) used picture and auditory prompts to teach four adults to transition independently through ten acquired vocational tasks. This study used picture and auditory prompts and focused on teaching transition behaviors rather than acquisition of vocational skills.

The majority of vocational skills taught using video prompting are simple entry-level skills such as cleaning or assembling (Cannella-Malone et al., 2006; Cihak et al., 2008; Davies et al., 2002; Mitchell et al., 2000; Van Laarhoven & Van Laarhoven-Myers, 2006). Very few researchers used preference assessments to determine what skills the student would like to learn. In conclusion, little research has been done on teaching preferred complex tasks to students with severe disabilities.

Systematic and repeated research has shown that video prompting can be a successful intervention for students with disabilities. Despite the positive outcomes it is necessary to extend the literature on video prompting interventions. Researchers have stated that more research needs to be conducted investigating the effects of video prompting on older students (Delano, 2007; Hitchcock, Dowrick, & Prater, 2003). When research-based instruction is used, post-school outcomes for students with developmental disabilities tend to be more positive (Test et al., 2009).

Furthermore, researchers have stated that there have been few studies examining the effects of video technology to teach students vocational tasks (Allen et al., 2010; Cihak et al., 2007; Mechling & Gustafson, 2008). Video prompting is an evidence-based practice for students learning employment skills (Furniss, 2001; Taber-Doughty et al., 2011). Future research needs to focus on the effects of video prompting with older students who are moving towards employment. Researchers have even described the need to teach more complex vocational skills using video prompting (Allen et al., 2010; Charlop-Christy, Le & Freeman, 2000; Cihak & Schrader, 2008; Delano, 2009; Riffel et al., 2005). The literature clearly demonstrates that video prompting can be used to teach specific skills. However, the majority of these skills are related to simple daily living tasks such as washing dishes or putting away groceries. Students should be expected to acquire more complex skills that will prepare them for integrated employment (Grigal et al., 2011). There is a need to extend the literature in teaching complex vocational tasks to students with severe disabilities. The purpose of the current research is to address this important area of inquiry.

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Appendix B

Key Rack Task Analysis
Scoring Form
Quality Check
Independent iPad use

Student: __________________ Date: ____________________

Researcher: __________________ Time: ____________________

Task Analysis	Student Response	Quality Check	Tally of prompts for iPad use
1. Verbal Cue: Push punch down until you hear a pop Student will: - Pick up spring loaded punch - Put the tip of the punch onto the first mark on the wooden plank - Use the whole left hand to grasp the punch - Use flat right hand to push down on the punch until it springs back		5. Student pushes the punch (holding punch in left hand and pushing down with the right hand) until they hear a “pop”; resulting in an indentation 4. Student pushes the punch (uses only one hand, or switches position of hands) until they hear a pop; resulting in an indentation. 3. Student puts the tip of punch on the wood; no mark or indentation 2. Student picks up the punch 1. Student does not use punch.	
2. Verbal Cue: Push punch down until you hear a pop. Student will: - Put the tip of the punch onto the second mark on the wooden plank - Use whole left hand to grasp the punch - Use flat right hand to push down on the punch until it springs back		5. Student pushes the punch (holding punch in left hand and pushing down with the right hand) until they hear a “pop”; resulting in an indentation 4. Student pushes on the punch (uses only one hand, or switches position of hands) until they hear a pop; resulting in an indentation 3. Student puts the tip of punch on the wood; no mark or indentation 2. Student picks up the punch	

		1. Student does not use punch.	
3. Verbal Cue: Push punch down until you hear a pop Student will: - Put the tip of the punch onto the first mark on the wooden plank - Use whole left hand to grasp the punch - Use flat right hand to push down on the punch until it springs back		5. Student pushes the punch (holding punch in left hand and pushing down with the right hand) until they hear a "pop"; resulting in an indentation 4. Student pushes on the punch (uses only one hand, or switches position of hands) until they hear a pop; resulting in an indentation. 3. Student puts the tip of punch on the wood; no mark or indentation 2. Student picks up the punch 1. Student does not use punch.	
4. Verbal Cue: Drill the first hole Student will - Pick up the hand drill - Put the drill bit in the first hole. - Left hand holds the body of the drill - Right hand turns the handle clockwise. - Keep turning the handle until the yellow line on the drill bit touches the wood		5. Student holds drill with left hand and turns with right hand; student drills a hole until the yellow tape reaches the wood 4. Student holds drill with left hand and drills with right hand; student drills hole, but stops after the yellow line 3. Student drills the hole but stops before the yellow line 2. Student puts tip of drill in the wood, but does not turn the handle 1. Student does not use drill or hands are incorrectly placed, resulting in an inability to drill.	
5. Verbal Cue: Remove the drill Student will: - Left hand continues to grasp drill. - Use right hand to turn the handle counter clockwise while pulling the		5.Student holds drill with the left hand and uses right hand to turn handle counter-clockwise while pulling upward; student stops when the drill is out of the wood 4. Student holds drill with the left hand and	

drill upwards - Continue until drill is no longer in the wood.		uses right hand to turn handle counter clockwise; student stops when the drill is still in the wood 3. Student pulls drill out without turning the handle 2. Student uses either hand to turn handle clockwise 1. Student does not turn handle or pull drill out of wood	
5. Verbal Cue: Drill the second hole Student will: - Put the drill bit into the wood - Left hand holds the body of the drill - Right hand turns the handle clockwise. - Keep turning the handle until the yellow line on the drill bit touches the wood		5. Student holds the drill with the left hand and turns handle with right hand; student drills a hole until the yellow tape reaches the wood 4. Student holds drill with the left hand and turns handle with the right hand; student drills hole, but stops after the yellow line 3. Student drills the hole but stops before the yellow line 2. Student puts tip of drill in the wood, but does not turn the handle 1. Student does not use drill or has incorrect hand placement, resulting in an inability to drill.	
6. Verbal Cue: Remove the drill Student will: - Continue holding the drill with your left hand - Use right hand to turn the handle counter clockwise while pulling the drill upwards - Continue until drill is no longer in the wood.		5. Student uses left hand to hold drill and right hand to turn handle counter-clockwise while pulling upward; student stops when the drill is out of the wood 4. Student holds drill with the left hand and uses right hand to turn handle counter clockwise; student stops when the drill is still in the wood 3. Student pulls drill out without turning the handle 2. Student uses either	

		hand to turns handle clockwise 1. Student does not turn handle or pull drill out of wood	
7. Verbal Cue: Drill the third hole Student will: - Put the drill bit into the wood - Left hand holds the body of the drill - Right hand turns the handle clockwise. - Keep turning the handle until the yellow line on the drill bit touches the wood		5. Student holds drill with the left hand turns the handle with the right hand; student drills a hole until the yellow tape reaches the wood 4. Student holds the drill with the left hand and turns the handle with the right hand; student drills hole, but stops after the yellow line 3. Student drills the hole but stops before the yellow line 2. Student puts tip of drill in the wood, but does not turn the handle 1. Student does not use drill or has incorrect hand placement, resulting in an inability to drill.	
8. Verbal Cue: Remove the drill Student will: - Continue to hold drill with left hand - Use right hand to turn the handle counter clockwise while pulling the drill upwards - Continue until drill is no longer in the wood. - Set drill down on the table.		5. Student holds drill with left hand and uses right hand to turn handle counter-clockwise while pulling upward; student stops when the drill is out of the wood 4. Student uses left hand to hold drill and right hand to turn handle counter clockwise; student stops when the drill is still in the wood 3. Student pulls drill out without turning the handle 2. Student uses either hand to turn handle clockwise 1. Student does not turn handle or pull drill out of wood	
9. Verbal Cue: Put hook in first hole Student will:		5. Student will pick up hook and put the screw side in the first hole 4. Student will pick up	

- Pick up a hook - Put the screw into the first hole		hook and put screw side in a random hole 3. Student will pick up hook and put it on the wood 2. Student will pick up screw and put it near the wood 1. Student will pick up screw.	
10. Verbal Cue: Twist hook Student will: - Use left hand to hold the hook in place - Use right hand to twist the hook clockwise - Continue twisting until the hook is tight - Make sure tip of the hook is pointing upwards		5. Student will grasp hook and twist clockwise until the hook is tight and the tip points up. 4. Student will grasp hook and twist clockwise until the hook is tight and the tip points any direction other than up 3. Student will grasp hook and twist clockwise, hook is loose 2. Student will grasp hook 1. Student will not grasp hook or twist hook	
11. Verbal Cue: Put hook in second hole Student will: - Pick up a hook - Put the screw into the second hole		5. Student will pick up hook and put the screw side in the second hole 4. Student will pick up hook and put screw side in a random hole 3. Student will pick up hook and put it on the wood 2. Student will pick up screw and put it near the wood 1. Student will pick up screw.	
12. Verbal Cue: Twist hook Student will: - Use left hand to hold hook in place. - Use right hand to twist the hook clockwise - Continue twisting until the hook is tight - Make sure the tip of the hook is pointing		5. Student will grasp hook and twist clockwise until the hook is tight and the tip points up. 4. Student will grasp hook and twist clockwise until the hook is tight and the tip points any direction other than up 3. Student will grasp hook and twist clockwise, hook is loose	

upwards		2. Student will grasp hook 1. Student will not grasp hook or twist hook	
13. Verbal Cue: Put hook in third hole Student will: - Pick up the third hook - Put the tip of the hook into the third hole		5. Student will pick up hook and put the screw side in the third hole 4. Student will pick up hook and put screw side in a random hole 3. Student will pick up hook and put it on the wood 2. Student will pick up screw and put it near the wood 1. Student will pick up screw.	
14. Verbal Cue: Twist hook Student will: - Use left hand to hold hook in place - Use right hand to twist the hook clockwise - Continue twisting until the hook is tight - Make sure the tip of the hook is pointing upwards		5. Student will grasp hook and twist clockwise until the hook is tight and the tip points up. 4. Student will grasp hook and twist clockwise until the hook is tight and the tip points any direction other than up 3. Student will grasp hook and twist clockwise, hook is loose 2. Student will grasp hook 1. Student will not grasp hook or twist hook	

Appendix C

Treatment Fidelity Checklist

Teacher:__________________________ Date:____________________________

Student: __________________________ Time: ___________________________

Phase	Step Implemented	Yes	No
Set-up	Place three marks on wood indicating where hooks need to go		
	Clamp wood onto table		
	Place Spring-loaded punch, hand drill and hooks on table		
	Place iPad to the left of the wood		
	Tape visual prompts on the corner, to the left of the wood		
Baseline	Verbally instruct student, “It is time to make a key rack”		
	Point to the wood that is clamped onto the table		
	Show student the finished premade project		
	Verbally tell student, “Make a key rack like this”		
	Collect data using the scoring sheet		
	Graph data		
Intervention	Verbally instruct the student, “It is time to make a key rack”		
	Point to the wood that is clamped onto the table		
	Verbally tell the student, “Make a key rack like this”		
	Prompt student if needed to access video on iPad using a system of least prompts		
	Record the number of prompts needed to access the iPad		
	Collect data using the scoring sheet		
	Repeat steps 3-5		
	Graph Data		
Post-Intervention	Point to the wood that is clamped onto the table		
	Show student the premade project		
	Verbally tell student, “Make a key rack like this”		
	Collect data using the scoring sheet		
	Graph data		

Appendix D

Social Validity Questionnaire

The participants were asked to respond to five questions to determine their level of satisfaction with the intervention. The assessment will align with the participants' cognitive abilities. Participants were presented with two possible picture answers and were asked to make a selection. The researcher read the question out loud, presented the two options, waited for a response and recorded the answer. If a response was not given, the teacher repeated the question. If a response was not given on the second request, the researcher indicated the participant's refusal to answer on the scoring sheet.

Social Validity Questionnaire for Brady

Question	Answer Options	Student Answer					
		Trial 1	Trial 2	Trial 3	Trial 4	Trial 5	Preference
1. Do you want to make a key rack using..	iPad	X		X	X	X	iPad was picked as a preference 4/5 times.
	Teacher		X				
2. Do you want to make a key rack…	Alone						Working in a group was picked as a preference 5/5 times.
	In a group	X	X	X	X	X	
3. Do you want to make…	The same thing	X			X		Making different things was picked as a preference 3/5 times
	Different things		X	X		X	
4. Do you want to learn on …	A computer						An iPad was picked as a preference for learning 5/5 times.
	An iPad	X	X	X	X	X	

Social Validity Questionnaire for Ria							
Question	Answer Options	Student Answer					
		Trial 1	Trial 2	Trial 3	Trial 4	Trial 5	Preference
5. Do you want to make a key rack using..	iPad	X	X			X	The iPad was picked as a preference for 3/5 trials.
	Teacher			X	X		
6. Do you want to make a key rack…	Alone						Working in a group was picked as a preference 5/5 times.
	In a group	X	X	X	X	X	
7. Do you want to make…	The same thing	X	X	X	X		Making the same thing was picked as a preference 3/5 times
	Different things					X	
8. Do you want to learn on …	A computer						An iPad was picked as a preference for learning 5/5 times.
	An iPad	X	X	X	X	X	