Maintaining Vocational Skills of Individuals with Autism and Developmental Disabilities through Video Modeling

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Abstract: A modified pre/posttest control group design was used to measure the effectiveness of video modeling on the maintenance of vocational tasks for six students with autism spectrum disorder and/or developmental disabilities. Each student was assigned two vocational tasks at their employment settings and their independence with each task was measured prior to and following a two week break. One task was assigned to the video modeling condition, while the other task served as the control for each participant. Participants reviewed videos while on break and the results indicated that all students increased their independence with both tasks following the video modeling procedure. Findings were surprising yet consistent across learners. Plausible explanations for the results are shared.

Employment First initiatives indicate that employment is the first priority and preferred outcome of persons with disabilities, with integrated, competitive employment options being the ultimate vocational outcome (Niemiec, Lavin, & Owens, 2009). Unfortunately, employment trends for adults with autism spectrum disorders (ASD) and developmental disabilities (DD) continue to lag behind their peers with milder disabilities and the general population (Camento, Marder, Wagner, & Cardosa, 2003). Overall reports indicate that approximately 75% of adults with DD are unemployed and findings from the national longitudinal study (NLST 2) on transition outcomes for young adults with disabilities indicate that employment rates for youth with ASD and DD are significantly lower than their non-disabled peers and that the severity of an individual’s disability is associated with higher rates of unemployment (Wagner, Newman Camento, Garza, & Levine, 2005; Wagner, Newman, Camento, Levine, & Garza, 2006).

Researchers have also demonstrated that adult outcomes related to employment, independent living, and social success are insufficient for individuals with ASD (Cederlund, Hagberg, Billstedt, Gilberg, & Gilberg, 2008; Hendricks & Wehman, 2009).

Although the employment outcomes for most individuals with autism and developmental disabilities are less than optimal, there is also research indicating that if provided with adequate vocational training and support, these individuals can be productively employed (Wehman, Inge, Revell, & Brooke, 2007; Wehman, Targett, & Young, 2007) and that if they have paid experiences prior to graduation, they will fare much better than those who have not (Hasazi et al., 2005; Wehman, 2006). As a result, a recommended practice is to provide vocational training and programming at the secondary and possibly middle school level for students with more significant needs.

One of the primary goals of vocational programming is to assist learners with performing their job-related tasks as independently as possible so that they can become competitively employed and sustain their employment while limiting their reliance on other personnel (Lancioni & O’Reilly, 2001). Several re-
searchers have demonstrated the effectiveness of using visual supports such as pictures to support learners on the job (Copeland & Hughes, 2000; Martin, Mithaug, & Burger, 1990; Martin, Mithaug, & Frazier, 1992; Wacker & Berg, 1983), while others have demonstrated the effectiveness of using picture and/or auditory supports presented on handheld devices for promoting self-management among learners with autism and intellectual disability in vocational settings (Cihak, Kessler, & Alberto, 2007; Cihak, Kessler, & Alberto, 2008; Davies, Stock, & Wehmeyer, 2002a; 2002b; Furniss et al., 2001; Riffel et al., 2005; Spence-Cochran & Pearl, 2009). For individuals to become competitively employed and to sustain their employment, they must work as independently as possible, limit their reliance on job coaches or other personnel, and maintain or improve their skills over time (Agran, 1997).

To promote independent work-related behaviors and to decrease reliance on staff, several researchers have investigated the effectiveness of using video-based instruction to support individuals with ASD and DD. Early research conducted on the use of video technology within the vocational domain has had mixed results. For example, Morgan and Salzberg (1992) used video-assisted instruction to teach employment-related problem-solving skills to adults with disabilities. They showed participants videos of positive and negative examples and asked a series of questions to provide discrimination training prior to assessing participants in actual work settings. Results indicated that effects did not generalize until behavioral rehearsal was introduced for 2 of the 3 participants. Martin et al. (1992) compared several different instructional strategies for teaching assembly skills to secondary students with moderate disabilities in an empty classroom. These strategies included: 1) photographs (a photo of completed piece of furniture), 2) sequenced pictures (comprised of line drawings), 3) sequenced pictures plus modeling (same as previous, only the experimenters also modeled assembly), 4) picture referencing (used in conjunction with sequenced pictures, the experimenter also pointed back to the picture following an error or no response), 5) video modeling (participant was shown video clip of step prior to performing step; currently referred to as video prompting, and 6) video referencing (used in conjunction with previous, only video clip was played again following errors or no response; also called video feedback). The researchers found picture referencing to be more effective than video modeling and video referencing. However, video referencing (e.g., video feedback) was almost as effective as picture referencing, and video modeling became more robust as students had more exposure to it.

Recently, several researchers have investigated the effectiveness of using video-based instruction to support and improve vocational outcomes of individuals with autism and developmental disabilities in school-based (Cihak & Schrader, 2008) and community-based employment settings (Allen, Wallace, Greene, Bowen, & Burke (2010); Allen, Wallace, Renes, Bowen, & Burke; 2010; Kellems, 2010; Van Laarhoven, Johnson, Van Laarhoven-Myers, Grider, & Grider, 2009; Van Laarhoven, Van Laarhoven-Myers, & Zurita, 2007). Some of the above researchers used video modeling procedures, which involves having learners watch a video of an entire skill sequence prior to engaging in the task (Cihak & Schrader, 2008; Allen, Wallace, Greene, et al., 2010; Allen, Wallace, Renes, et al., 2010; Van Laarhoven et al., 2007); others used video prompting, which involves having learners watch short segments of the skill sequence to prompt responses during task engagement (e.g., watch a segment, perform the step(s), watch next segment, perform next step, and so on until the task is complete) (Van Laarhoven et al., 2009); while Kellems (2010) used a combination of video modeling and video/auditory prompting.

In a school-based research study, Cihak and Schrader (2008) compared two different types of video models to teach students with ASD vocational skills at a public high school. Four adolescents with ASD were taught pre-vocational and vocational tasks through a combination of a least-to-most prompting hierarchy and video modeling (watching an entire video of a task prior to task engagement), which was presented on a laptop located in the setting where tasks were performed. Participants were taught two tasks each (i.e., preparing a family pack and preparing a first aid kit or making
copies and sending a fax). One task was taught using video self-models while the other was taught using a video depicting an unfamiliar adult (other model). Results indicated that both types of models were effective for teaching targeted vocational skills.

Researchers who supported employees in community-based environments evaluated the effectiveness of video modeling, video prompting, or a combination of the two. For example, Allen, Wallace, and Renes, et al. (2010) used video modeling to teach four young men (ages 16–25) with high-functioning ASD skills such as waving, shaking hands, wiggling tongue and ears, wagging tail, winking eyes, etc. to animate a Rocky Raccoon WalkAround® mascot costume to entertain customers in a retail setting. Two instructional videos were used to teach the targeted skills. One video was scripted and comprised of both subjective or point-of-view narrated videos that showed someone’s hands performing the basic movements inside the suit, and other models, that showed what the actions looked like from outside the suit. The second video, a narrated naturalistic video, showed each of the targeted skills used in different combinations and in a variety of situations with customers in a busy community-based retail setting. Following baseline, participants watched both videos twice in a back room of the retail setting and the occurrence of the multiple targeted skills were measured on the floor of the large warehouse retail store immediately after the viewing using a 15 sec partial interval recording procedure. Three of the four participants required one additional viewing, and results indicated that all participants increased their use of the targeted skills and all met criterion at least three times during the intervention phase. In addition, two of the four maintained their skills after one month. In a similar study, Allen, Wallace, Greene, et al. (2010) taught one adolescent and two young adults with ASD the same skills as in the previous study using similar instructional materials. Results indicated that all three participants increased their use of multiple target behaviors following the video modeling procedure without additional prompting or reinforcement from research staff. Targeted mascot skills were maintained by two of the three participants one month later and all three participants generalized their skills to another costume (Chester Cheetah) in a different retail setting three months following instruction. In addition, all three participants indicated satisfaction with the job and in wearing the costume.

In another study incorporating the use of video-based instruction, Van Laarhoven, et al. (2007) evaluated the effectiveness of using a pocket pc to teach two adolescents with ASD and DD vocational tasks in competitive, community-based employment settings (i.e., Red Robin and Applebees, respectively). Participants were taught three different tasks in their respective work sites through video modeling and video feedback strategies. Video sequences of targeted skills (e.g., portioning recipes, rolling silverware, sanitizing silverware, etc.) were presented on a pocket pc prior to engagement with each task (video modeling) and following repeated errors (video feedback). Effectiveness of the video-based strategies and the utility of the handheld device were evaluated using a multiple probe design across tasks and results indicated that the introduction of the video-based procedures were associated with significant increases in independent responding with participants meeting criterion on all three tasks within 3–7 sessions. Van Laarhoven et al. (2009) extended research on video-based instruction with the use of mobile devices to evaluate if a young man with moderate intellectual disability could use a video iPod to increase independent correct responding with three job-related tasks in a community-based, no-kill animal shelter. Skill sequences were broken into short video segments and the participant used the iPod as a video prompting and feedback device. Results indicated that the introduction of the video iPod was associated with immediate and substantial gains in independent correct responding across job related-tasks (i.e., cleaning bathroom, mopping floors and taking out garbage, and cleaning kennels) and the participant also used the video iPod independently and received very few prompts from a job coach.

Kellems (2010) also investigated the effectiveness of using a video iPod to support employees in community-based settings. In this study, four young men with ASD used video models presented on a fifth generation video
iPod to increase their independence with three different vocational tasks at their community-based employment settings. Participants were employed in different settings (i.e., bowling alley, airport, community center, museum) and were taught new or not yet mastered skills required in their respective employment settings (e.g., cleaning bathroom, vacuuming, filling out order book, taking inventory, recycling cardboard). Videos were divided into smaller chunks with title screens and written descriptions (and narration for two participants) placed before each video segment, which was also narrated. A person familiar with the participant served as the model and participants viewed the videos prior to engaging in the targeted tasks (video modeling) and also brought the iPod with them in case they needed to refer back to it during task engagement (video or auditory prompting). Three participants used the iPod as a video modeling and prompting device for initial trials, with one using it more as an auditory prompting device during task engagement. Results indicated that the introduction of the video iPod was associated with immediate and substantial gains in the percentage of steps completed correctly and that the results maintained over time.

Based on the available research, it appears that video-based instruction is an effective strategy for supporting employees in school and community-based environments. Although increasing independence with vocational skills is critical for gaining and keeping employment, another important consideration is the maintenance of those skills, particularly when learners have interruptions in work schedules due to vacations, extended absences, emergency closures, or seasonal work schedules. Such interruptions have the potential to result in deterioration of performance if learners are unable to practice skills on a consistent basis, which could result in the need for retraining, increased support from job coaches or coworkers, or even termination of employment. It is critical for family members, practitioners, and employers to not only identify research-based strategies that will support and improve vocational skills for individuals with disabilities, but to also identify methods for maintaining and supporting these skills over time. The purpose of this study was to investigate the effectiveness of using video modeling to maintain vocational skills of six high school students with ASD and/or DD over winter break. All students reviewed a video of one of their job-related tasks at home during winter break and their level of performance was evaluated prior to and following a two week break from work.

Method

Participants

Participants included six high school students with autism and/or developmental disabilities who were participating in vocational training through their local public high school. The high school vocational/transition teacher, and second author, identified students for participation based on their difficulty with maintaining skills over time, particularly over extended vacations, absences, or long weekends. Permission slips were sent home to identified students, and those who returned informed consent and assent forms participated in the study. Originally, seven students met the conditions for participation, but one student dropped out due lack of follow through in fulfilling the requirements of the study, which involved watching a video ten times over winter break. As a result, only five males and one female participated fully in the study. Participants ranged from 15 to 17 years old (see Table 1). All participants received a combination of instruction in self-contained classrooms along with instruction in integrated general education classes, and were involved in either school-based vocational training, or participated in community-based vocational experiences at local area businesses.

Manny. Manny, a 15 year old male, in the 9th grade, qualified for special education services under the category of Autism. On the most recent Differential Abilities Scales assessment, Manny scored 75 (borderline) on Verbal Abilities, 107 (average) on Nonverbal Abilities, and 100 (average) on Spatial Abilities. Manny received a composite score of 80 on the Stanford-Binet Intelligence Scale (4th Edition), with subscale scores of 84 (Low Average) on Verbal Reasoning, 114 (High Average) on Quantitative Reasoning, and 74 (Slow Learner) on Short-Term Memory.
Manny participated in community-based work training at Buffalo Wild Wings two hours per week during vocational skills class. Manny’s responsibilities at Buffalo Wild Wings involved various tasks related to getting the restaurant ready to open. He portioned food items according to specified weight standards, and demonstrated the ability to operate the scales and weigh the food product appropriately. According to his teacher, Manny displayed the ability to apply basic reading and math skills in the work environment and basic computer operation in the classroom environment. Manny’s strengths in the work setting included the ability to follow verbal directions, and learn a variety of tasks. His teacher also reported that Manny often became distracted by people or objects within the room while on the job site and that maintaining appropriate personal space for the work environment was also problematic for Manny.

Nate. Nate, a 16 year old male, qualified for special education services under the category of ID (mild range) and Autism. On Differential Abilities Scales assessment, Nate scored an 83 in General Conceptual Ability, 71 on Verbal Abilities, and 104 on Nonverbal Abilities. Nate received a score of 65 (intellectually deficient) on the WISC-III.

Nate participated in community based work training (as part of his vocational skills class) at Buffalo Wild Wings two days each week for 45-minute sessions. His responsibilities included food preparation, portioning food, and clean-up. Nate demonstrated the ability to portion food items according to specified weight standards, and operated the scales and weighed the food product appropriately. According to his teacher, Nate displayed the ability to apply basic reading and math skills in the work environment and basic computer operation in the classroom environment. Nate’s teacher also reported that he was very capable of learning a variety of tasks and skills. However, his ability to manage social interactions and communications with peers and supervisors appropriately had been a primary obstacle in the work environment. Nate often looked to adults for affirmation/confirmation on many basic decisions related to routines, and could be overly dependent on prompting from adults.

Artie. Artie, a 17 year old male, qualified for special education services under the category of Autism. Previous standardized cognitive ability testing done with Artie using both verbal and nonverbal measures indicated overall cognitive functioning in borderline range. Artie received a score of 88 on the WISC-IV.

Artie participated in community based work training at multiple off-campus sites. Artie worked at Buffalo Wild Wings, where his responsibilities included food preparation, portioning food, and clean-up. Artie worked at Buffalo Wild Wings two days per week for a semester for 45 minutes each session. He also worked at an elder care facility where his responsibilities included transporting residents to the dining room for activities, and leading exercises for residents. There, he worked one day per week for a 30–45 minute session. Artie also worked at a pet shelter one day per week for a 30–45 minute session. His responsibilities at the pet shelter included: washing

<table>
<thead>
<tr>
<th>Student</th>
<th>Age</th>
<th>Gender</th>
<th>Diagnosis</th>
<th>IQ Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nate</td>
<td>16</td>
<td>Male</td>
<td>ID (mild range) and Autism</td>
<td>WISC-III Full Scale IQ: 65</td>
</tr>
<tr>
<td>Artie</td>
<td>17</td>
<td>Male</td>
<td>Autism</td>
<td>WISC-IV Full Scale IQ: 88</td>
</tr>
<tr>
<td>Victoria</td>
<td>15</td>
<td>Female</td>
<td>ID (moderate range)</td>
<td>WISC-IV Full Scale IQ: 44</td>
</tr>
<tr>
<td>Ben</td>
<td>16</td>
<td>Male</td>
<td>ID (moderate range)</td>
<td>WISC-III Full Scale IQ: 42</td>
</tr>
<tr>
<td>Neville</td>
<td>16</td>
<td>Male</td>
<td>ID (moderate range), Down Syndrome, &amp; Autism</td>
<td>WISC-IV Full Scale IQ: 42</td>
</tr>
</tbody>
</table>

TABLE 1

Demographic Information

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</tbody>
</table>
dishes, cleaning door handles and chair rails, and folding towels.

Artie’s teacher reported that Artie’s strengths included always being on time to catch the bus, having good hygiene, wearing appropriate work attire (work shirt when needed, closed toe shoes, etc.), and politeness and friendliness when engaging with job coaches, supervisors, coworkers, and/or residents. His teacher also reported that Artie had a high level of anxiety associated with work related tasks and often responded to this anxiety by constantly asking questions of staff members about every step of a work task. Knowing what he needed to do at all times seemed to help to ease Artie’s level of anxiety. Artie’s teacher also reported that Artie often cried when he became overly anxious, overwhelmed, or frustrated.

Victoria. Victoria, a 15 year old female, qualified for special education services under the category of Intellectual Disability (moderate range). Victoria received a full scale score of 44 on the WISC-IV.

Four days a week, Victoria completed various in-school jobs to gain pre-vocational work experience. She worked in the school kitchen laying cookies, recycling throughout the building, feeding the class pet turtle, cleaning the classroom, folding brochures, and cleaning the cafeteria. Victoria’s teacher reported that Victoria often did well following a written set of directions to complete a job task and always followed directions without negotiation. Victoria’s teacher also reported that Victoria had a contagious smile, a positive attitude, and was respectful of both staff and students. She was always on time to class, put forth effort, and got along well with her classmates. She was a very hard worker and was voted by her classmates and job coaches as her class’ first employee of the month. An area for targeted growth reported by Victoria’s teacher included the areas of assertion and self-advocacy on the job. Victoria tended to be quiet and shy by nature and required adult prompting to approach staff members within the building with whom she was working if she needed assistance or clarification. Victoria also struggled with memorizing her personal information.

Ben. Ben, a 16 year old male, qualified for special education services under the category of Intellectual Disability (moderate range). Ben received a full scale IQ score of 42 on the WISC-IV.

Four days per week, Ben performed jobs within the school building. In-school jobs that Ben performed included collecting laundry from the PE locker rooms and loading them into the washing machine, organizing equipment in the pool room, delivering hall passes, replenishing copier paper to various locations within the school building, recycling, and laying frozen cookies on cookie sheets in the school kitchen. When completing work tasks, Ben used a folder with visual directions (both printed words and pictures) for each step of the job sequence. Ben’s teacher reported that Ben had difficulty with decoding, which made following the written directions difficult. Ben was dependent on an adult to read the steps/directions to him. Therefore, because he struggled with reading the steps independently, Ben relied heavily on prompting for task initiation. Ben’s teacher also reported that he frequently required proximity control to maintain on-task behavior during work tasks.

Neville. Neville, a 16 year old male, qualified for special education services under the category of Intellectual Disability (moderate range). He was also diagnosed with Down Syndrome, Autism and received a full scale score of 42 (significantly deficient cognition) on the WISC-IV. Neville’s teacher reported that Neville was basically non-verbal but that he made a few utterances and approximations and occasionally echoed vocabulary. Neville’s teacher also reported that he had mastered the Picture Exchange Communication Systems (PECS), and had been learning to use a DynaVox V AAC device for the past 2 years.

As part of his on-site vocational training, Neville performed a series of in-school jobs with 1:1 adult assistance. Neville’s job tasks included: shredding, washing windows, loading the dishwasher, washing clothes for the PE department, and recycling. He completed tasks using the accommodation of visual/photo task analyses and/or video modeling to perform jobs. Neville’s teacher reported that Neville worked for reinforcers such as Sprite or music. Neville also engaged in physically aggressive behaviors when he began to feel anxious, and that due to his aggressive
behaviors, Neville had a lengthy behavior support plan in place and all staff working with him were required to be CPI (crisis prevention intervention) trained and certified.

Setting

Three students, Manny, Nate, and Artie, worked at a Buffalo Wild Wings located in the western suburbs of Chicago. Part of their job responsibilities involved portioning food items and this task required them to access the kitchen, storage room, refrigerator, freezer, and front dining area of the restaurant to complete this aspect of the job. Two students, Victoria and Ben, had in-school jobs at a large public suburban high school also located in the western suburbs of Chicago. Both students worked in the large kitchen at the school and assisted with food preparation and also collected recycling throughout the building. To complete the cookie panning task, they had to access the kitchen, storage area, and refrigerator in the school. To complete the recycling task, they had to access the cafeteria, classrooms throughout the building, and the outdoor recycling area. The other student, Neville, had classroom jobs, which were also completed at the high school in a classroom that had a full kitchen, dishwasher, and washer and dryer. Participants viewed videos at their homes over the winter break and one time in a classroom at school following break.

Design

A modified pre/posttest control group design was used, with one of the tasks serving as the control. Each student was assigned two vocational tasks at their employment settings and their independence with each task was measured prior to and following break. One task was assigned to the video modeling condition, while the other task served as the control for each participant (no video).

Task Selection and Assignment

Once students were identified for participation, the first and second authors reviewed tasks the students currently performed at their respective work sites. Tasks that were similar in terms of complexity, difficulty, and duration were selected as targeted skills. Pretest scores were calculated and used to measure the students’ degree of independence with each task and to assign students’ tasks to the different conditions for counterbalancing purposes. All students working at Buffalo Wild Wings performed best with the portioning prep task. To assign tasks to the video versus no video/control conditions, Manny and Artie, who had the most disparate scores between tasks, had their tasks assigned so that one student had their highest scoring task assigned to the video condition, while the other had their highest scoring task assigned to the no video condition. The other students working at Buffalo Wild Wings had somewhat similar scores on both pretests and their tasks were counterbalanced and randomly assigned to one of the conditions; however, one of these participants dropped out due to lack of follow through with the research requirements (Please see Table 2). Students performing in-school jobs both performed better with the kitchen task (panning cookies). Their

<table>
<thead>
<tr>
<th>Student</th>
<th>Task with Video</th>
<th>Task without Video</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manny</td>
<td>Portioning Prep</td>
<td>Portioning Cleanup</td>
</tr>
<tr>
<td>Nate</td>
<td>Portioning Cleanup</td>
<td>Portioning Prep</td>
</tr>
<tr>
<td>Artie</td>
<td>Portioning Cleanup</td>
<td>Portioning Prep</td>
</tr>
<tr>
<td>Victoria</td>
<td>Panning Cookies</td>
<td>Recycling</td>
</tr>
<tr>
<td>Ben</td>
<td>Recycling</td>
<td>Panning Cookies</td>
</tr>
<tr>
<td>Neville</td>
<td>Loading Dishwasher</td>
<td>Loading Washing Machine</td>
</tr>
</tbody>
</table>

TABLE 2

Task Assignment

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tasks were randomly assigned and counter-balanced across conditions. Because Neville was the only participant completing classroom jobs, his tasks were randomly assigned to the video and control conditions.

**Instructional Materials**

Videos were filmed in the employment environments where tasks were performed. The vocational teacher, an adult female and second author, served as the model in most videos. She described her actions while performing the tasks, thus providing narration for the videos. An adult female (job coach) and female peer served as the models for the recycling and panning cookies tasks. For these videos, the vocational teacher narrated the steps while simultaneously holding the camera and filming the task. All skill sequences were filmed in short segments using a combination of wide angle and zoom shots to display salient features of the task. For example, when the step of the task involved moving about the environment or engaging in larger movements, wide angle shots were used. When the step required detailed or smaller movements (e.g., setting controls on dishwasher or washer), zoom shots were used. As a result, the videos incorporated the use of other and subjective/point of view models (filmed from the perspective of the individual completing the task).

Video files were captured from a digital video camera and edited using Pinnacle Studio 12 editing software (Pinnacle Systems, 2008). With this software, it was possible to render video files in DVD format so that they could be burned on to a DVD and played on a variety of DVD players and/or computers with DVD players. A narrated title screen was placed at the front of each video describing the task being performed. Transition swipes were placed between the picture and video segments and between edited chunks to make the video run smoothly and to reduce the length of the video files for each step. For example, in the segment that displayed video for “bring portioned boxes to back room,” several video chunks were edited and sequenced together. Rather than showing the entire process of walking through the building to the back room, which takes too much time, only the beginning portion of walking to the back room was shown, followed by a segment showing the model entering the kitchen, and then walking to the back room. The transition swipes were placed between photos and edited segments to make them less choppy. Video models were created for tasks assigned to the video condition, placed on a DVD, and sent home with students over winter break.

**Procedure**

Once two target skills were identified, data were collected on both skills to obtain present levels of performance for each task across all participants. After tasks were assigned to the two conditions and videos created, students were given a folder containing a DVD of their video task and a video log to complete. The teacher explained how to use the DVD and video log before they left for break. Students were instructed to watch the DVD at least 10 times over break, and at least five times each week in order to be eligible to win a five dollar gift card from Subway. She showed students how to complete the log, which required each student to write the date they watched the video, sign their name next to the date, and obtain a parent signature. The video log had written directions at the top and a table with three columns for the date, student signature, and parent signature, and ten blank rows to complete. Students were informed they had to have every spot filled to receive the Subway card and that they had to return their folder when they came back to school. Additional forms were placed in the folder in the event that students wanted to view the videos more than ten times.

Participants reviewed a video of one of their identified tasks a minimum of 10 times while at home over break and obtained a parent signature to verify their viewing of the video. When they returned to school after two weeks, participants turned in their folders to the teacher and received their gift cards. Six of the original seven participants fulfilled this requirement and received the gift card, while the seventh student was dropped from the study due to lack of compliance with research procedures. In addition to watching the video 10 times over break, students were all asked
to view the video one more time at school to make sure too much time had not elapsed from their last viewing of the video prior to going to work. Data were again collected on student performance on both tasks when they returned to work.

**Data Collection Procedures**

All vocational tasks were task analyzed and event recording data were collected on independent correct responses and/or prompt levels provided from the teacher or job coach for each step in the skill sequence. Participants engaged in all steps of both tasks and were evaluated on the prompt level needed to respond correctly to each step within the skill sequences during pretests and posttests. To obtain data on prompt levels, the system of least prompts was used with a 5 sec delay between prompts and a weighted score was assigned to each prompt. More weight was given to prompts that required more independence on the part of the student and less reliance on the part of the teacher or job coach. Thus, higher scores were indicative of increasing independence. Each prompt level was assigned a score with independent correct responses receiving the highest score (4), followed by gestural/point prompts (3), verbal prompts (2), physical prompts (1), and resistance/refusal (0). Scores for each step within the skill sequences were added and divided by the total points possible and multiplied by 100. Pretests and posttests were conducted in the same manner for both conditions and no visual supports were provided during testing.

**Data Analysis**

Data were analyzed by computing the mean growth from pre- to posttest scores for the video and control conditions and comparing them. In addition, effect sizes were computed using Cohen’s $d$ (Cohen, 1988) which represents the difference between the pretest and posttest scores, divided by the pooled standard deviations. The following scale is generally used to interpret the magnitude of an effect based on $d$: Small effect- $0 < d < .2$; moderate effect- $.2 < d < .8$; large effect- $d > .8$.

**Interobserver Agreement and Procedural Reliability**

Reliability sessions were conducted by the second author and a job coach for 100% of all sessions. The percentage agreement index (i.e., number of agreements divided by number of agreements plus disagreements and multiplied by 100) was used to calculate interobserver agreement. Agreement for instructional prompts across sessions resulted in a mean score of 99% (range = 96–100). In addition, the second observer collected procedural reliability data (Billingsley, White, & Munson, 1980). These measures included the following: a) checking to ensure that the correct condition was applied to the intended task for each participant, b) that the prompting hierarchy was delivered as intended, and c) that a wait time of 5 sec was implemented between prompts. Procedural reliability was calculated by dividing number of correct measures by total number of assessed variables and multiplying by 100. Procedural reliability agreement averaged 100%.

**Social Validity**

Informal interviews were conducted with the participants and their teacher following intervention. During their interviews, students were asked 1) if they liked watching the videos over break, 2) if they thought the videos helped them to remember how to perform their work-related tasks, and 3) if they would like to watch additional videos in the future. All students indicated positive responses to the questions. All participants indicated that they liked watching the videos, that the videos helped them to remember how to do their tasks, and that they would like to participate in future investigations, particularly if they could earn gift cards. Manny in particular appreciated being able to earn a Subway gift card and he was very motivated to earn it. A few parents also indicated that they felt watching the video at home was a very simple intervention to implement and that they would be willing to participate in future investigations. In addition, the vocational teacher felt that the intervention was very effective and, other than the time required to create the videos, was easily implemented. She also indicated that she
would probably use this type of intervention in the future.

Results

The purpose of this study was to measure the effectiveness of video modeling on the maintenance of vocational tasks for six students with ASD and/or DD. Each student was assigned two vocational tasks at their employment setting and their independence with each task was measured prior to and following winter break. One task was assigned to the video modeling condition, while the other task served as the control for each participant. Participants reviewed videos while on break and the results indicated that all students increased their independence with both tasks following the video modeling procedure. A visual display of individual student performance across tasks can be found in Figures 1 and 2.

All participants improved their performance under the video modeling condition and tasks assigned to the video condition resulted in a mean increase of 24%, demonstrating substantial growth from pretest to posttest levels. In addition, a large effect size was observed \( (d = 2.29) \) for tasks in which videos were used. Participants also demonstrated improvement in performance under the control condition (no video) and tasks that were assigned to the control condition resulted in a mean increase of 14%, which also demonstrated substantial growth and a large effect size \( (d = 1.36) \). When comparing the video modeling and control conditions, the effect size for the difference in growth between the groups was eta-squared (equivalently, \( r \)-squared) .41, which is a large difference between the groups, suggesting that the video modeling condition resulted in much more substantial gains for participants.

Discussion

Our goal for this study was to determine if watching a video of a work-related task would assist students with maintaining skills following a two week break. Participants reviewed a work video for one of their targeted vocational tasks and not the other (control). Our original intent was to determine if watching a video would result in maintenance of the targeted skill, rather than improvement of the skill. We anticipated maintenance level responding for the video modeling task and deterioration in performance of the control task; however, results indicated that all students increased their independence with both tasks following the video modeling procedure. Findings were surprising, yet consistent across learners.

One plausible explanation for the increase in the control task (no video) was that students generalized learning from the task with the video to the other task. For example, response generalization may have occurred for the portioning setup and cleanup tasks because they had several steps, stimulus materials, and response requirements in common. The portioning prep involved accessing the kitchen, storage room, refrigerator, etc. to gather needed materials, while the portioning cleanup involved returning the materials to the same locations. The same holds true for the loading dishwasher and loading washing machine tasks. Repeated viewings of the video during break may have led to greater recognition of these stimuli, thus leading to improved performance across tasks.

Although generalization across tasks is a plausible explanation for tasks with similar stimulus and response requirements, this does not explain the results of the in-school jobs, which included panning cookies and recycling. Panning cookies and Recycling had very few response requirements, stimulus materials, steps, or features in common. It may be possible that simply viewing the school-based work environment assisted with cognitive recall of the other task. It is also possible that participants were exposed to the tasks at home during break (e.g., cooking, cleaning, making cookies, recycling, washing clothes or dishes), thus improving their performance in the job or school setting.

Overall, motivation to perform the tasks well may explain skill maintenance and improvement, regardless of the tasks involved. All participants received gift cards for participation, which may have served to enhance their desire to complete their tasks successfully. However, one participant did not earn a gift card due to noncompliance with the research conditions. Perhaps his lack of compliance with watching the video was due to the lack of reinforcing value of the gift card,
which suggests the need to conduct preference assessments and subsequent individualization of reinforcers. However, the gift card must have held some value for this young man because he attempted to forge his parents’ signature on the video log to receive it, which

Figure 1. Results of Pretests and Posttests at Buffalo Wild Wings.
brings up another issue entirely. One possible downfall of this approach, and a possible limitation of the study, is that there is no way to verify or guarantee that all students watched
the videos as intended and reported. Each participant was required to watch the video 10 times (five times per week) over the course of the two week break. Although the video log required a dated parent signature to verify each viewing of the video, there is no way to state with certainty that the videos were watched as reported. Without the ability to directly observe video watching behavior, we have to trust that the parent signatures were legitimate measures of treatment fidelity and compliance. Nonetheless, we are confident that participants in this study viewed the videos due, in part, to the excitement they expressed when turning in the video logs, as well as their subsequent performance on targeted skills.

Based on the similar results acquired in the video and no-video conditions, future studies may take different approaches to assessing the effectiveness of video modeling to maintain vocational skills. First, future studies might employ tasks that have little or no overlap in response requirements to reduce the possibility of carryover effects. Second, video modeling as a maintenance tool could be applied to non-vocational behaviors such as domestic, community, or social skills. Third, the effects of using video modeling to maintain skills over breaks could be tested over a longer period of time, such as summer vacation. Future studies might also compare the effects of watching the videos spread throughout the break in comparison to several booster sessions presented immediately before work resumes.

There are several benefits to using video-based supports to promote independence in employment settings. First and foremost, video-based supports often result in increased independence, generalization, and maintenance of job-related skills for learners and less reliance on job coaches or coworkers, all of which are critical for sustaining competitive employment. In addition, the availability of video supports allows learners to repeatedly review modeled tasks if more support is required. This is an attractive feature because this form of repeated modeling might not be feasible or desirable for coworkers or supervisors to deliver in a work setting when they are simultaneously responsible for completing their own job-related tasks. Another positive attribute of using video supports is that they can provide learners with the ability to rehearse their tasks prior to going to work and can also serve as refreshers for employees who have memory problems or for employees who have been away from work for an extended period of time due to vacation, illness, or seasonal work. Employers often appreciate the use of video-based supports because they can profit from their use to train all new employees, which assures cost effective and streamlined training of new hires. In addition, once organizations have numerous samples of videos available from different employers or that depict a diverse collection of job tasks, learners can view the array of videos to identify and indicate their job preferences. Findings from this study were surprising, yet provide a relevant and practical strategy for a wide range of stakeholders who are interested in not only increasing the independence of learners in employment settings, but also for promoting maintenance and generalization of skills. Review of videos outside of the vocational setting may be an efficient way to improve, maintain, and generalize skills.

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