Continuous Video Modeling to Prompt Completion of Multi-Component Tasks by Adults with Moderate Intellectual Disability

Linda C. Mechling
University of North Carolina Wilmington

Kevin M. Ayres
University of Georgia

Kaitlin Purrazzella and Kimberly Purrazzella
University of North Carolina Wilmington

Abstract: This investigation examined the ability of four adults with moderate intellectual disability to complete multi-component tasks using continuous video modeling. Continuous video modeling, which is a newly researched application of video modeling, presents video in a “looping” format which automatically repeats playing of the video while the individual completes a task. Four adult males, ages 29 to 35 years, with a diagnosis of Down syndrome and moderate intellectual disability, were participants in the study. A multiple probe design across three sets of multi-component tasks (folding multiple sizes of towels; sorting an assortment of recycling materials; preparing a buffet table with multiple serving stations) was used to evaluate the effectiveness of continuous video modeling. Overall results suggest that this newly explored method for presenting video models was an effective presentation mode for three of the four participants and for one participant when completing two of three tasks.

In their quest for effective teaching strategies that promote increased skills and independent functioning for persons with moderate intellectual disability and autism spectrum disorders, researchers and special educators have allocated considerable attention to the use of video modeling (VM) (Ayres & Langone, 2005; Delano, 2007; McCoy & Hermansen, 2007; Mechling, 2005; Shukla-Mehta, Miller, & Callahan, 2010). Video modeling procedures require viewing a task on a screen in its entirety followed by imitation of the behavior viewed. Video modeling has been demonstrated to be effective with a range of multi-step tasks including: wearing a mascot costume and entertaining customers at a retail store (Allen, Wallace, Renes, Bowen, & Burke, 2010); using an iPod (Hammond, Whatley, Ayres, & Gast, 2010); rolling, sorting and sanitizing silverware within a restaurant setting (Van Laarhoven, Van Laarhoven-Myers, & Zurita, 2007); folding clothing, sandwich making, and juice making (Murzynski & Bourret, 2007); and pet care, table setting, and preparing letters for mailing (Shipley-Benamou, Lutzker, & Taubman, 2002).

While video modeling requires the stoppage of the video followed by performance of the task, a similar procedure, termed simultaneous video modeling (SVM) requires the person to simultaneously complete the task while the video is playing (Sancho, Sidener, Reeve, & Sidener, 2010). To date, four studies were identified which evaluated SVM and two of those studies compared the effects of SVM with VM. Taber-Doughty, Patton, and Brennan (2008) compared delayed video modeling on a computer (watching a video model 1 hr 5 min to 1 hr 35 min prior to beginning...
The two procedures were used to assist students with using a public library computer to locate book call numbers in order to locate books and DVDs and using the Dewey Decimal Classification System. Both systems were effective however; when the learners stated their most preferred modeling system, it was found that the preferred systems were more effective for two of the three participants. In a second comparison study, Sancho et al. (2010) found no difference in performance for one student with a diagnosis of autism when using VM compared to SVM while finding SVM more effective for a second student with a diagnosis of autism in terms of acquisition of play skills.

The other two studies strictly evaluated the use of SVM to teach skills to students with a diagnosis of autism. Blum-Dimaya, Reeve, Reeve, and Hoch (2010) used SVM to teach manipulation of the video game Guitar Hero II to four students with Autism Spectrum Disorders (ASD) and found that each student learned to play songs and to generalize playing the game to a song and setting not used during training. The fourth study identified in the literature was a case study (Kinney, Vedora, & Stromer, 2003) in which one student diagnosed with autism wrote spelling words while simultaneously viewing a video model of her teacher writing the target words.

Using a very similar method, the current study used and termed the procedure continuous video modeling (CVM). CVM differs from SVM in that the video does not stop playing after one complete model, but instead continues to play (loop) back through the model over and over until the user completes the task. The effects of video prompting and video modeling may each have limits based on learner characteristics and the delivery format. With video prompting, the natural sequence of task completion is interrupted by the stop and start of the prompt and step completion. Further, in many cases, as task completion progresses over time, students no longer need the same amount of prompting of steps which may slow task completion. Video modeling, on the other hand, allows for a much more fluid performance of a task but places demands on the learner’s ability to recall all steps depicted in the video.

The current study was the first to investigate the use of CVM and did so with four adults with moderate intellectual disability completing complex tasks which were referred to as multi-component tasks. These tasks required participants to complete a task (e.g., folding a large towel) with multiple steps (i.e., 5 steps), multiple times (5 large towels), and across multiple towel sizes (3 sizes, 15 total towels). Participants completed these multi-component tasks (recycling, setting up a buffet table, and folding towels) while the video model continued to play (looping). The current study differed from three of the four studies identified using SVM and both of the studies comparing SVM and VM, in that all prompting for task completion was provided by the video in order to evaluate the isolated effects of video models as the controlling prompt during simultaneous prompting. In the SVM studies, instructors also provided prompts when student errors occurred while the video was playing (supplementary instruction). In the current study, the only prompts provided by the instructor were attentional in nature to direct students to view the video model if an error occurred or to redirect them if they failed to attend to the video model.

The primary research question was: Will continuous video modeling (CVM) be effective in prompting adults with moderate intellectual disability to complete multi-component tasks.

Method

Participants

Four male participants, ages 29–35 years, participated in the study. They were enrolled in a post high school community college program for adults with developmental disabilities. They attended the program four days a week with the exception of Bret who worked at a pharmaceutical company one day per week. The four men also participated in a previous study evaluating video modeling to teach home living tasks (Mechling, Ayres, Purrazzella, & Purrazzella, 2012). Participants were required to have a formal diagnosis of a developmental disability prior to entering the program. For placement and instructional goal development, the community college
program administered the Comprehensive Adult Student Assessment Systems (CASAS, 2002). This assessment was an approved test used by the state community college system compensatory education programs.

Bret was 30 years and 6 months of age at the end of the study and had a diagnosis of Down syndrome and a moderate intellectual disability. His full scale IQ score on the Wechsler Adult Intelligence Scale, Third Edition (Wechsler, 1997) was 54 and his Vineland Adaptive Behavior Scale composite score was 46 (Sparrow, Balla, & Cicchetti, 1984). His scaled score on the CASA Reading Assessment was 203 (grade range of 2–3.9) and his scaled score on the CASA Math Assessment was 170 (grade range equivalence of 0–1.9). He was verbal and articulate and freely shared information about his likes, dislikes, and interests. He sometimes refused to participate in study sessions if they were scheduled too close to his break time and he was concerned that he would not finish in time. He read job advertisements and simple information in a newspaper and on the internet. He interpreted job-related signs, charts, and checklists such as work schedules, and read labels and simple recipes on frozen foods. He counted bills and some simple (same coin) combinations, and made purchases from coin operated machines such as a newspaper and soda. He was also learning to write his social security number and to complete a rental property application. He was employed part time at a local pharmaceutical company delivering mail and supplies.

Crosby, 29 years and three months of age at the end of the study, had a diagnosis of Down syndrome, moderate intellectual disability, and a hearing impairment. His full scale IQ was 50 on the Wechsler Adult Intelligence Scale, Third Edition (Wechsler, 1997). His scaled score on the CASA Reading-Beginning Literacy-Life Skills test was a 187 (grade equivalence of 0–1.9). He spoke softly in one to two word sentences and frequently nodded his head and smiled or provided a “thumbs up” to indicate approval. He read functional sight words used for shopping (e.g., milk, eggs, bread, and butter) and recognized the days of the week and months of the year in print. He was also learning to use an appointment book with digital times, counting simple dollar and five dollar bill combinations, and reading prices. He was unemployed at the time of the study, but had previously worked at a Sonic fast food restaurant bussing tables. He wrote his first and last name and copied personal information from an identification card he kept in his wallet. He completed simple household chores and prepared simple snacks, breakfasts, and lunches.

Chip was 36 years of age at the end of the study and he was diagnosed with a moderate intellectual disability, Down syndrome and depression unspecified. An IQ score was not available in his program record. His scaled score on the CASA Reading-Beginning Literacy-Life Skills test was a 192 (grade equivalence of 0–1.9). He spoke in complete sentences, but exhibited disfluency. He interpreted advertisements, signs, and labels such as prices on items, clothing sizes, functional community signs (e.g., no smoking), and bus numbers. He wrote his full name and phone number. He completed simple household and cooking tasks within a supervised apartment living arrangement. He did not wear a watch, but told time on the hour using an analog clock. He also identified months and dates of the year. He shopped using a large bill method or a debit card. He enjoyed shopping for clothes, but preferred to purchase clothing sizes that were too small. He also located items in a grocery store using a picture-based system and had memorized where some items were located. He was meticulous in completing tasks and verbally perseverated on upcoming events or topics that concerned him.

Jeremiah was 30 years and 1 month of age at the end of the study and was diagnosed with a moderate intellectual disability and Down syndrome. His full scale IQ score was 42 on the Stanford-Binet Intelligence Scales – Fourth Edition (Thorndike, Hagan, & Sattler, 1986). His scaled score on the CASA Reading-Beginning Literacy-Life Skills test was a 184 (grade equivalence of 0–1.9). He spoke in complete sentences using familiar and repetitive phrases such as, “Are you kidding me?” He enjoyed humor and was social with peers. He wrote his first and last name and copied some words from print. He recognized logos such as McDonalds and k-mart and some functional sight words and signs such as “restroom”. He had a basic understanding of number concepts and
counted objects and placed amounts up to 10. He also recognized numerals in print up to 10. He used bills to make purchases in vending machines, but relied on cashier assistance when purchasing items in stores in amounts above one dollar. He lived in a supervised apartment arrangement where he was able to complete simple house hold chores with reminders and prepare simple meals without the use of a stove. He was also able to care for his personal needs with reminders.

**Tasks, Materials, and Equipment**

Three sets of multi-component tasks were selected for the study: folding towels, sorting containers for recycling, and setting up a buffet table. The folding task included bath towels, hand towels, and wash clothes (5 towels per size, 15 total) while sorting containers for recycling included plastic, cardboard, glass, and aluminum products (five exemplars per type, 20 total items) and setting up a buffet table included platters, towels, resting plates (for holding soiled serving spoons and tongs), serving spoons, and tongs (5 each, 25 total) (Table 1). Folding tasks provided the most complex set of behaviors because each towel required multiple steps and the steps were not identical across the three sizes of towels although the larger sizes incorporated the steps of the smaller sizes. Setting the buffet required students to place each item in a place setting in a specific order on the table; however, participants could place all five items of one type out on the table at once (i.e., place all five trays on the table) or place one place setting with

### Table 1

**Task Steps for Target Behaviors**

<table>
<thead>
<tr>
<th>Sorting Recycling Containers</th>
<th>Setting Buffet Table</th>
<th>Folding Towels</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sort Cardboard Containers</strong> (5 Exemplars) into Cardboard Box</td>
<td>Place Setting 1</td>
<td>Small Bath Towel (5 Towels)</td>
</tr>
<tr>
<td>Lean Cuisine macaroni and cheese</td>
<td>Large serving tray</td>
<td>Flat out on table</td>
</tr>
<tr>
<td>Green Giant green beans</td>
<td>Small plate</td>
<td>Fold up</td>
</tr>
<tr>
<td>Granola bar box</td>
<td>Towel</td>
<td>Fold over</td>
</tr>
<tr>
<td>Popcorn box</td>
<td>Serving spoon at top of plate</td>
<td>Place in pile</td>
</tr>
<tr>
<td>Ziplock bags box</td>
<td>Serving tongs at bottom of plate</td>
<td></td>
</tr>
<tr>
<td><strong>Sort Plastic Containers (5 Exemplars) into Small White Bag</strong></td>
<td><strong>Place Setting 2</strong></td>
<td><strong>Hand Towel (5 Towels)</strong></td>
</tr>
<tr>
<td>White milk carton</td>
<td>Large serving tray</td>
<td>Flat out on table</td>
</tr>
<tr>
<td>White vitamin container</td>
<td>Small plate</td>
<td>Fold up</td>
</tr>
<tr>
<td>White yogurt container</td>
<td>Towel</td>
<td>Fold over</td>
</tr>
<tr>
<td>Clear blueberry container</td>
<td>Serving spoon at top of plate</td>
<td>Fold up</td>
</tr>
<tr>
<td>Clear peanut container</td>
<td>Serving tongs at bottom of plate</td>
<td>Place in pile</td>
</tr>
<tr>
<td><strong>Sort Glass Containers (5 Exemplars) into Large Brown Bag</strong></td>
<td><strong>Place Setting 3</strong></td>
<td>Large Bath Towel (5 Towels)</td>
</tr>
<tr>
<td>Olive jar</td>
<td>Large serving tray</td>
<td>Flat out on table</td>
</tr>
<tr>
<td>Salsa jar</td>
<td>Small plate</td>
<td>Fold up</td>
</tr>
<tr>
<td>Pickle jar</td>
<td>Towel</td>
<td>Fold over</td>
</tr>
<tr>
<td>Garlic jar</td>
<td>Serving spoon at top of plate</td>
<td>Fold up</td>
</tr>
<tr>
<td>Club soda jar</td>
<td>Serving tongs at bottom of plate</td>
<td>Place in pile</td>
</tr>
<tr>
<td><strong>Sort Aluminum Containers (5 Exemplars) into Brown Bag</strong></td>
<td><strong>Place Setting 4</strong></td>
<td></td>
</tr>
<tr>
<td>Tuna can without label</td>
<td>Large serving tray</td>
<td></td>
</tr>
<tr>
<td>Soda can</td>
<td>Small plate</td>
<td></td>
</tr>
<tr>
<td>Vegetable can with label</td>
<td>Towel</td>
<td></td>
</tr>
<tr>
<td>Baked beans</td>
<td>Serving spoon at top of plate</td>
<td></td>
</tr>
<tr>
<td>Canned corn</td>
<td>Serving tongs at bottom of plate</td>
<td></td>
</tr>
</tbody>
</table>

each of the five items out at once. Sorting containers for recycling could be completed in any order by the participants as long as items were placed in the correct container (i.e., all glass containers in the large brown bag).

Video recordings were made using an adult model (reliability data collector) who was unfamiliar to the participants at the start of the study. The video camera focused on the hands of the model rather than the model’s entire body and scenes were recorded from behind the model so that the left to right perspective when completing the tasks was identical to that used during task performance (i.e., folding a towel over from the participant’s right to left side; placing glass bottles into the bag on the far right). The person operating the camera also stood on a chair so that material manipulation was not blocked by the model’s body. Voice over directions for completing the steps of each task were recorded using the voice of the person operating the camera. Video recordings were made using a Sony digital camera and videos were edited using Windows Movie Maker and saved onto PowerPoint slides using the “Loop Until Stopped” and “Play Automatically” features of the program. These features allowed the video to continue to play and repeatedly model the tasks while the participant was completing the steps. The video model for folding towels presented the folding sequence of two small towels, followed by two medium size towels, and two large towels. The video model for sorting recycling containers showed all materials being sorted into the correct container and did so by placing the five glass containers in the large brown bag followed by five cardboard containers being placed in the box, five aluminum containers being placed in the white bag, and the five plastic containers being placed in the smaller brown bag. The video model for setting the buffet demonstrated placing the five items in the correct order for one place setting. In addition, each video model began by showing a model of the finished product before modeling the sequence (i.e., all containers in the correct bags, all towels folded and stacked into the correct size piles, and the entire buffet of five place settings). The times to play one video loop were 51 seconds for setting the buffet, one minute and 46 seconds for folding the towels, and one minute and 58 seconds for recycling.

CVM was played on a Dell Latitude laptop computer placed on top of a storage crate. This was done to situate the video at eye level of the participants while performing the tasks. The crate sat on top of a table and was positioned at the participant’s left side. Task materials were placed on four 8 foot tables placed in a 2 × 2 arrangement in order to accommodate multiple materials. In addition, the towels were stacked, in random order on a chair next to the table. The recycling containers were also placed in random order on the table and the buffet materials were arranged and stacked by category (i.e., all trays were stacked together and placed at the left end of the tables).

The instructor stood to the right of the participant and the reliability data collector stood across the tables from the participant. The instructor was responsible for starting the video model. Initially participants watched the entire video before beginning the task; however, Bret and Chip began to complete the tasks during the first loop when they became familiar with the tasks on subsequent sessions.

Experimental Design

A multiple probe design across three behaviors and replicated across four adults with moderate intellectual disability (Gast, 2010) was used to evaluate the effects of CVM on the completion of multi-component tasks. The dependent variable was the percentage of steps completed independently correct during probe and instructional sessions. Conditions included an initial baseline probe of all three tasks prior to training followed by CVM instruction.

Once baseline performance was stable for a participant across a minimum of three sessions, CVM was introduced for the first task. The order of task presentation was counterbalanced across the four participants in order to evaluate performance across different tasks without the influence of ordering effects. CVM instruction continued with a set until mastery level (100% independent correct performance for three sessions) was reached.

One probe session without CVM was subsequently conducted prior to the introduction
of a new set and probe sessions, using CVM, served as a measure of maintenance for previously mastered sets. This sequence continued until all three tasks received CVM.

Data Collection, Response Definitions

All sessions across conditions were delivered one-on-one with each participant and tasks were presented using a total task format. Response definitions were identical across baseline probe and CVM instructional sessions. When using CVM participants could proceed in one of three ways: (a) complete a step or place an item without referring to the video; (b) pick up an item (i.e., glass container) and watch the video, waiting for it to loop around to the correct modeling example (waiting for the video model); or (c) pick up an item or fold the towel according to what was currently being played on the video (keeping up with the video). Once the step to be completed and the matching video sequence was viewed, the participant was given 3 seconds to initiate and 5 seconds to complete the step. If an error occurred, the instructor prompted the student to “watch” or “wait” for the video while pointing to the screen and the response was recorded as an error, but the student was provided with the opportunity to complete the step before continuing to the next step. The instructor did not prompt the student on how to complete the step.

During baseline and probe sessions responses were recorded as correct if the student initiated a step of each task analysis within 3 seconds after delivery of the task direction or previous step and completed each step within 5 seconds. No instructor prompts were provided for task completion in order to evaluate the singular effect of the CVM procedure. An incorrect response was defined as either: (a) student failed to initiate a step within 3 seconds of the previous step (latency error); (b) incorrect performance of a step (topography error); (c) starting a step but failing to complete the step within 5 seconds (duration error); or (d) performing a step out of the predetermined order (sequence error). The sequence error only applied to folding towels. Sorting recycling containers, for example, could be done in any order depending on which item the participant picked up next. Similarly, they could pick up any size towel, but once the towel was selected it had to be folded in the correct sequence. The buffet items could also be selected in any order, but they were required to be placed in specific positions on the table.

History Training

History training was employed to teach the participants how to use CVM. All four participants had a history of using video modeling and were therefore conditioned to watching the entire video and then completing a task. Participants were required to sort five different colors, letters, numerals, and shapes (20 total) into four containers. Initially history training with CVM began with items placed in random order on the table; however, the task level was too difficult and participants were not progressing. History training was then divided into two phases: (a) Phase 1: items were placed in separate stacks by category; and (b) Phase 2: items were placed in random order on the table. Each participant was required to sort all items with 100% accuracy across one session before moving from Phase 1 to Phase 2 and from Phase 2 into the Baseline condition. The main objectives of the history training were to teach the participants to: a) select the item on the screen and place it in the correct container according to what the video was showing; or b) select the next item on the table and wait for the video to loop around to show where to place the item.

Baseline Probe Procedures

Probe sessions were conducted during the initial baseline condition for a minimum of three sessions or until data were stable or demonstrating a contra-therapeutic trend. Following CVM intervention with each task, probe sessions were again conducted with any task which had not yet received instruction and one probe session was conducted for previously introduced tasks to evaluate maintenance of skills using CVM. All three tasks were completed during each session of the initial baseline condition and one to three tasks were completed on subsequent probe sessions depending on the number of tasks requiring a probe.
At the beginning of each session the instructor provided a task direction such as, “It’s time to fold towels,” and waited 3 seconds for the student to initiate the first step of the task analysis. The instructor delivered verbal praise for steps completed correctly and ignored any incorrect responses. The instructor did not complete any incorrect steps because the tasks were such that subsequent steps were not dependent on completion of previous steps. At the end of the session students were provided with verbal praise for completion of the task.

**Instructional Sessions with CVM**

CVM sessions began for each participant after a minimum of three probe sessions or when data stabilized or showed a contra-therapeutic effect. Sessions began with delivery of a task direction (i.e., “Watch the video and sort the recycling”) followed by the instructor starting the video model. Responses were recorded as correct if the participant initiated steps of each task analysis within 3 seconds after the completion of the previous step and completed each step within 5 seconds. Participants were initially instructed to watch the entire video before beginning the task, but in subsequent sessions they could initiate the first step at any time during the playing of the video model. Participants could also stop and watch the video model at any point during task completion. Students could use CVM to complete a step in three ways: (a) complete the step without looking at the video; (b) look first at the video and then complete the corresponding step (i.e., watch the person on the video placing the serving tray on the table and then picking it up and placing it); or (c) pick up an item from the array and wait for the video to loop around to the corresponding step (i.e., pick up a serving spoon and then wait for the video to loop around to that sequence to show where the spoon should be placed). CVM continued until a participant reached criteria (100% independent correct across three sessions).

**Interobserver Agreement (IOA) and Treatment Fidelity**

A second observer (third or fourth author) recorded participant and instructor responses for an average of 40.2% of all probe and CVM sessions for all participants and during 30.3%, 40%, 46.2%, and 42.3% of all conditions for Bret, Crosby, Chip, and Jeremiah respectively. IOA was calculated by dividing the total number of agreements by the number of agreements plus disagreements and multiplying by 100 (Ayres & Gast, 2010). A mean of 99.2% IOA (range of 84%–100%) was found for correct responses across all students and conditions and 98.3%, 98.8%, 99.4%, and 99.9% for Bret, Crosby, Chip, and Jeremiah respectively.

Procedural integrity data were also collected on the following: (a) correct materials available and positioned on the table; (b) correct CVM started; (c) general task direction provided before starting the video model; (d) provision of 3 seconds for participants to initiate each step; (e) provision of 5 seconds for participants to complete each step; (f) delivery of reinforcement; and (g) instructor prompts delivered only for watching the video if an error occurred during CVM. Procedural integrity was calculated by dividing the number of procedural steps completed correctly by the total number of possible procedural steps and multiplying by 100 (Gast, 2010). The mean procedural integrity was 99.9% (range = 97.3%–100%). The only errors were due to materials not being properly placed on the table (i.e., recycling containers placed in the wrong order; towels covering serving spoons) and two such errors occurred during one session.

**Results**

**History Training and Efficiency Data**

History training was required to teach the participants how to follow the video model while tasks were being completed. Bret was immediately able to follow the CVM procedure during history training and required only one session of training. Chip required four sessions while Jeremiah required eight sessions and Crosby required eight sessions to learn the procedure. In addition to the number of sessions to learn the procedure, data are also presented in Table 2 for sessions to criteria and the average number of minutes to complete the different tasks across the four participants. Although participants
could watch the video loop multiple times, minutes to complete the recycling and buffet tasks were relatively short and task completion time decreased over time. In addition, all participants discontinued watching the video model in its entirety before beginning the first step of the task.

**CVM**

Figures 1–4 depict the percentage of correct responses for each task during probe and CVM intervention sessions across the four participants. With the exception of Bret, all participants showed low levels of correct responding prior to introduction of CVM with each set of tasks. In particular, Bret was able to complete steps of folding towels although his method differed somewhat from the task analysis written for the study and the corresponding video. He continued to use his previously learned method of folding towels for two sessions when CVM was introduced, but quickly adapted to the different sequence. Probe sessions for his remaining two tasks demonstrated performance at 25% correct or below. He demonstrated an abrupt change in performance on each of these tasks when CVM was introduced. Of the four participants, he was able to maintain a production pace equal to that being shown on the video and would quickly glance at the computer screen to receive information on a skill step. He was also able to maintain performance at 100% correct for two sets of tasks.

Crosby required five, eight, and ten sessions to reach criterion levels respectively for completing the recycling, buffet, and folding towel tasks. He also required the greatest number of sessions to criteria with the folding towel task using a different sequence for the last steps (rolling). While setting the buffet, he frequently committed errors by interchanging the position (top to bottom) of the serving spoons and tongs on the small plates and towels. He was also able to maintain performance at 100% correct for two sets of tasks.

Chip, unlike the other participants, performed the folding towel task with the least number of sessions to criterion (three). Similar to Crosby, he committed errors when setting the buffet by interchanging the position of the serving spoons and tongs in addition to placing the towels in the incorrect position. He was unable to maintain performance at 100% correct for folding towels or recycling and dropped to 80% correct performance with the recycling task on the last probe (misplaced plastic containers into the glass receptacle).

Jeremiah was unable to follow the sequence for folding the towels when using CVM. His best performance with that task was 44.3% correct when using CVM alone. After no improvement was observed in his data trend across six sessions with CVM, an error correction procedure using an instructor model was introduced. He showed immediate improvement in performance (84.3% correct on the first session), but he was unable to perform the steps of this task.

**TABLE 2**

<table>
<thead>
<tr>
<th>Participant</th>
<th>Folding Towels</th>
<th>Buffet</th>
<th>Recycling</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Sessions</td>
<td>Mean</td>
<td>Range</td>
</tr>
<tr>
<td>Bret</td>
<td>5</td>
<td>6.75</td>
<td>6–8</td>
</tr>
<tr>
<td>Crosby</td>
<td>10</td>
<td>10.22</td>
<td>8–13</td>
</tr>
<tr>
<td>Chip</td>
<td>3</td>
<td>7.25</td>
<td>7–8</td>
</tr>
<tr>
<td>Jeremiah</td>
<td>15*</td>
<td>7.15</td>
<td>5–9</td>
</tr>
<tr>
<td>All Students</td>
<td>33*</td>
<td>7.86</td>
<td>5–13</td>
</tr>
</tbody>
</table>

* Jeremiah did not reach criteria and CVM was discontinued after data stabilized with no progress.
beyond 97.1% correct following nine additional sessions. Errors were inconsistent across the size of towel and step of the task analysis. His second task, setting the buffet, was introduced after 15 sessions of instruction for folding towels. He required 12 ses-

Figure 1. Percentage of task steps correctly completed by Bret using continuous video modeling.
sions to reach criteria for setting the buffet and his performance dropped to 88.6% during the final probe session with the towels and he made one error with setting the buffet (spoon in the wrong position) on the final probe session. He demonstrated his best performance (seven trials to criteria) with his last task, recycling containers.

Discussion

Results from this study support use of the newly reported video modeling procedure, CVM, whereby the video continues to play or “loop” while the participant is completing a task. Such a variation may be more effective than watching an entire video (video model-
ing) and then attempting to complete a lengthy or complex task. In addition, it may be more efficient than starting and stopping a video (video prompting) which may interrupt the flow of task completion. Further, CVM may promote self-instruction as an individual is able to refer back to the instructional video at any point for assistance. Tasks for the study were selected that were repetitive in nature (i.e., sorting, multiple trials of the same task or

Figure 3. Percentage of task steps correctly completed by Chip using continuous video modeling.
steps) for the initial evaluation of the procedure. While deliberately selected, it should also be recognized that the type of tasks used may have also influenced the positive results and that other types of tasks requiring complex chained behaviors (i.e., following a rec-

Figure 4. Percentage of task steps correctly completed by Jeremiah using continuous video modeling. Closed circles represent correct responses using CVM and error correction procedure with instructor model.
ipe) whereby steps do not repeat themselves, may have differing results.

Like many potential users of the CVM procedure, the four participants in this study were familiar with using video modeling and Crosby had also used video prompting for completing tasks. Therefore, history training was required to teach participants how the new procedure differed from the other procedures (i.e., not waiting until the end of the video to start the task). Crosby required eight sessions of such training and although the order of task presentation was counter balanced for sequence effects, the first set introduced to each participant could also have involved a training effect. This appears to be a possible explanation for the decrease in session times for Jeremiah, but it did not occur across the order of sets for the other participants.

During CVM intervention, Crosby also required the longest session times (Table 2) to complete two of the three tasks. This was due to his waiting for the video to loop around to the material he selected rather than him selecting materials to match the video. For example, he would pick up a large towel from the pile to fold, but the video was modeling folding of the first of two small towels, thus he had to wait for the folding of two small and two medium towels before the video modeled folding of a large towel. While this process was effective and error free for Crosby, it did increase task completion time. In contrast, Chip was observed picking up a large towel from the top of the pile, but putting it down and searching for and picking up a small towel to match the video. He was further observed picking up an item that he knew was going to be modeled next on a video sequence. Time to complete tasks among the various video procedures (i.e., video prompting, video modeling, and CVM) should also be considered in future research.

It should also be recognized that some students may have a preference for one video procedure (i.e., video prompting) over others (Taber-Doughty et al., 2008) and that CVM may not be the preferred choice. In the current study Bret frequently voiced annoyance with the repetition of the voice over and video looping features of the program when he was at mastery levels of performance. He once commented, “You can turn that thing off, I don’t need to see it again,” during one session of CVM while setting the buffet.

A limitation of the study also centers around the social validity of requiring participants to learn a new sequence for folding towels. This task appears to have been the most complex of the three tasks and required the longest task completion time (sessions to criterion) with the exception of Chip. In an applied setting it may be more desirable to adapt the task to meet the current levels of performance of each participant if each method is equally effective and efficient and instructors would not un-teach a skill. It is likely that the task of folding towels was not more difficult than the other two tasks, but rather the participants found it difficult to change their method.

A further limitation of the study was the lack of maintenance data on all sets. Due to time restrictions, a final probe session was not conducted for the last set of tasks for each participant.

Implications for Design and Practice

The use of CVM appears to have potential benefits as a tool for providing cues for task completion without the need for adult supervision. However, this study is the first to examine and report this procedure in the research literature. Future developers of CVM programs should recognize and attend to the speed and pace of the video. In the current study the models in the video provided a 2–3 second delay between each step of each task. This delay may not be appropriate for all users and may require a long delay period in order for the user to perform the task without reliance on too many loops of the video. In addition, it was decided that one repetition (model) for folding each size of towel was too fast and that three or more repetitions on the video would be too slow (i.e., longer wait time for the video to loop around to the target step) and therefore two repetitions were used. This procedure may not be suitable for other users. Close attention to the perspective of the user should also be made so that video recordings are made from the correct angle (i.e., behind the user if a left to right sequence is important) and height (i.e., above the adult
model in order not to block the model’s hand or materials by the model’s body).

In summary, data from the current study indicate that CVM was effective in teaching four participants with moderate intellectual disability to complete multi-component tasks. As with any newly evaluated procedure, future research should attempt to replicate these results as well as to extend the evaluation of CVM to other tasks and students. In addition it will be important for researchers to compare the effects of CVM with other forms of video instruction such as video modeling and video prompting in terms of effectiveness and efficiency of instruction as well as the time required to produce the video programs.

References

Received: 10 May 2012
Initial Acceptance: 18 July 2012
Final Acceptance: 15 September 2012