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Computer-Based Video Instruction to Teach Young Adults with Moderate Intellectual Disabilities to Perform Multiple Step, Job Tasks in a Generalized Setting

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Abstract: This study evaluated the effectiveness of computer-based video instruction (CBVI) to teach three young adults with moderate intellectual disabilities to perform complex, multiple step, job tasks in a generalized setting. A multiple probe design across three job tasks and replicated across three students was used to evaluate the effectiveness of CBVI to teach job skills. All instructional sessions occurred through simulation that combined the technologies of video and computer-based instruction. Generalization of skills was assessed at the actual job site. Results indicate that CBVI was effective in teaching generalized, multi-step job tasks which were maintained over time.

Persons with moderate intellectual disabilities have demonstrated ability to perform and maintain many tasks required in competitive work settings when appropriate instruction and adequate instructional time are allotted (Davis, Brady, Williams, & Burta, 1992; Test, Grossi, & Keul, 1988) including janitorial (Agran, Fodor-Davis, Moore, & Deer, 1989; Bates, Cuvo, Miner, & Korabek, 2001; Grossi, 1998; Steed & Lutzker, 1997), hotel housekeeping (Allen, White, & Test, 1992; Taber, Alberto, & Fredrick, 1998), assembly (Alberto, Sharpton, Briggs, & Stright, 1986; Davies, Stock, & Wehmeyer, 2002a), packaging (Lagomarcino & Rusch, 1989) cleaning (Grossi & Heward, 1998; Mitchell, Schuster, Collins, & Gassaway, 2000; Simmons, & Flexer, 1992), operating office equipment (Browder, Lim, Lin, & Belfiore, 1993; Chandler, Schuster, & Stevens, 1993), food services (Agran, Fodor-Davis, Moore, & Martella, 1992; Davis et al., 1992) and stocking skills (Chandler et al.; Grossi).

Competitive employment positions often involve complex skills with multiple or chained response sequences (Wolery, Ault, Gast, Doyle, & Griffen, 1990; Woolcock, Lyon, & Woolcock, 1987) such as those found in dishwashing, collating, and filing (Chandler et al., 1993). Faced with multi-step, complex tasks, persons with disabilities often rely on considerable step by step instructions and prompting by instructors (Post & Storey, 2002; Steed & Lutzker, 1999), yet many jobs require persons to work alone due to the nature of the position or lack of funding for continued support. Common factors preventing job acquisition and retention have been identified as: (a) failure to complete an assigned task with multiple responses; (b) failure to complete a task in correct sequence (Rusch, Martin, Lagomarcino, & White, 1987; Woolcock et al.); and (c) inadequate productivity (Grossi & Heward, 1998; Rusch, 1986). In addition, lack of spontaneous initiation of tasks (Rusch, Mithaug, & Flexer, 1986) and inability to change routines or change from one task to the next (Rusch et al., 1987) have been identified as contributors to unemployment for persons with intellectual disabilities. Compounding these issues, work routines within competitive job markets may vary daily (Rusch et al., 1987) with changing job requirements due to different materials, new or updated equipment, rearrangement of work areas (Berg, Wacker, & Flynn, 1990) and inadequate, missing, or inoperable materials and equipment (Heller, Allgood, Ware, Arnold, & Castelle, 1996).

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In response to these demands, jobs typically made available to persons with disabilities are characterized as unskilled, entry level service occupations (Lagomarcino, 1990; Rusch et al., 1986). Such oversimplified tasks are selected due to minimal responsibilities to employees and decreased need for instruction rather than consideration of longitudinal employment objectives of individuals (Rusch et al.).

Staff restrictions often make it necessary for teachers to place large groups of students at one site. In order to assure employers at these sites that tasks assigned to the class can be efficiently completed, jobs are often provided to more capable students (Simmons & Flexer, 1992; Stainback, Stainback, Nietupski, & Hamre-Nietupski, 1986). Job assignments are often selected based on skills students already possess rather than their potential abilities. When more complex jobs are targeted, current practices often rely on extensive prompting by the instructor or in some instances, completion of job requirements by instructors. Many sites are selected based on what teachers and job trainers can "get" rather than on the interests of the students.

For many programs emphasis is placed on teaching job related behaviors rather than specific skills for a specific job (Martin, 1986). Focus is placed on teaching general skills such as on task behaviors, following directions, asking for assistance, interacting with co-workers, and handling stress (Kohler, 1994) rather than on the analysis of the jobs and the complex steps that could be taught for acquiring them. Consequently, many teachers continue to devote time in the classroom to nonfunctional tasks such as sorting by color, removing labels from cans, and stuffing envelopes, which focus on teaching work, related behaviors as apposed to specific job skills (Udvari-Solner, Jorgensen, & Courchane, 1992).

It is recognized that comprehensive analysis of jobs and the cost of individualized instruction can be expensive (Berkell, 1992) yet if persons are to compete for these jobs, one-on-one instruction, repeated instructional trials, and extensive modeling and prompting are required (Udvari-Solner et al., 1992). Professionals are actively investigating alternative strategies to promote independence, learning, and performance in individuals with disabilities ((Davis et al., 1992; Lancioni & O'Reilly, 2001; Post & Storey, 2002) and to improve educational programs which prepare persons for employment (Berkell, Lancioni & O'Reilly; Phelps, & Hanley-Maxwell, 1997). These strategies include: a) peer delivered self-instruction (Agran et al., 1992); b) self-monitoring and reinforcement (Lancioni & O'Reilly); c) response prompting systems including: simultaneous prompting (Fetko, Schuster, Harley, & Collins, 1999); constant time delay (Chandler et al., 1993); and system of least prompts (Simmons & Flexer, 1992); d) self-instruction (Agran et al., 1989; Allen et al., 1992; Lagomarcino & Rusch, 1989; Steed & Lutzker, 1997); and (e) the use of technology (Davies, Stock, & Wehmeyer, 2004).

Technology represents a potentially powerful means to provide job training and on-the-job support (Davies et al., 2002a). It has been investigated as a means to provide training and support, self-prompting, and decision-making activities in the forms of: (a) self-operated auditory prompting (Alberto et al., 1986; Davis et al., 1992; Grossi, 1998; Mitchell et al., 2000; Steed & Lutzker, 1999); (b) hand held audio and visual prompting systems (Davies et al., 2002a; 2002b; 2004; Riffel et al., 2005); and (c) simulations (Bates et al., 2001).

The purpose of this study was to investigate use of video technology to create simulated job sites. Use of video technology as a form of simulated instruction can be a valuable medium for creating multiple settings, events, and scenarios and is recommended for presenting instruction that will generalize from school to community environments (Malouf, MacArthur, & Radin, 1986; Mechling, 2005; Morse, Schuster, & Sandknop, 1996; Wissick, Lloyd, & Kinzie, 1992). Video recordings can be shown through a VCR, CD, or DVD player or incorporated into interactive computer-based video programs. These programs are able to bring real-world experiences into classrooms by recreating events and concepts in the classroom through high quality animated images. Video technology has been shown to be effective in teaching complex, chained tasks to persons with disabilities including: grocery shopping (Alcantara, 1994; Mechling & Gast, 2003); operation of a debit card machine (Mechling, Gast, & Barthold, 2003); cooking (Graves, Collins, Schuster, & Kleinert, 2005); mailing a letter (Shipley-Benamou, Lutzker, & Taubman, 2002); ordering at fast food restaurants (Mechling, Pridgen, & Cronin, 2005); self-help skills (Norman, Collins, & Schuster, 2001) and; following activity schedules (Kimball, Kinney, Taylor, & Stromer, 2004).

Although it is recognized that instruction in the community helps to ensure that students can use skills in those settings, limited resources such as time, money, transportation, and staff availability may limit opportunities for community-based instruction. To compound these issues, teachers also find themselves limited to the number and type of businesses that can be used as instructional sites. Sites are often secured on the basis of location (convenient to school or located on a city bus route), ability to accommodate multiple numbers of students, and simplicity of the tasks.

The purpose of the current study was to investigate use of computer-based video instruction (CBVI) to provide teaching examples and "life-like" scenarios in a simulated environment to teach competitive job skills to persons with moderate intellectual disabilities. The primary question addressed was: "Will computer-based video instruction (CBVI) be effective in teaching students to perform complex, multiple step, job tasks in a generalized setting?" To date a number of studies have evaluated the use of CBVI, however none have been used to teach employment skills.

Method

Participants

Three students (two male and one female) participated in the study and were selected based on their diagnosis of moderate intellectual disability, age, IEP objectives for increasing competitive job skills, and transition plan which identified the need for competitive employment upon completion of high school. Students were screened for the following entry level skills: (a) physical ability to complete motor skills of identified job tasks; (b) visual ability to see photographs and video recordings on the computer screen; and (c) wait response of 3 s. Students were enrolled in a local high school Transition Program for Young Adults (TPYA), designed to support transition from school to community. The program was located on the campus of a local university. All students had experience with computer-based instruction and were participating in community-based activities.

Jacob was a 20-year, 8 month old male diagnosed with a moderate intellectual disability (IQ 40, WISC-III) and Attention Deficit/Hyperactivity Disorder, which was characterized by lack of impulse control and concentration, and talking out. He was able to follow simple verbal directions and complete simple work tasks. He communicated verbally in complete sentences although he frequently repeated phrases and perseverated on topics. He was described as being friendly and empathetic towards others, eager to please, and "outgoing." He was able to take the city bus to familiar destinations and exit at the appropriate stop. He could locate items in stores from a picture list and find clothes in the correct size. His needs included: (a) following multiple step directions; (b) time management; (c) developing vocational skills with multiple steps; (d) purchasing using the next dollar strategy; and (e) planning, shopping, and preparing simple meals. He had a volunteer work history at *Habitat for Humanity* where he placed clothes on hangers and put them on racks. It was reported by his teacher that he enjoyed basketball, dancing, music, swimming, and shopping for clothes.

Arnold was a 21-year, 6 month old male diagnosed with a moderate intellectual disability (IQ 46, WISC-III) and Down syndrome. He was able to complete simple work tasks, but needed to increase self-initiations to move to the next task and problem solve what task to complete next. He was able to verbally communicate in complete sentences, but spoke in a quiet voice and rarely initiated conversations or made eye contact. He was able to cook, clean, and wash clothes with picture cues and locate items in stores using picture lists. He was able to use the city bus with minimal assistance for departing the bus at pre-determined destinations. His needs included: (a) purchasing using the next dollar strategy; (b) dialing telephone numbers; (c) making a bed with a fitted sheet; (d) shopping and preparing simple meals; and (e) crossing streets, parking lots, intersections, and driveways. He had a volunteer work history at *Habitat for Humanity* where he cleaned shelves and swept floors. He enjoyed basketball, music, and swimming and participated in national special olympic golf tournaments.

Shelly was a 20-year, 3 month old female diagnosed with a moderate intellectual disability (IQ 54, Stanford-Binet Intelligence Scale, Fourth Edition). She was described as friendly, well-mannered, well liked by peers, and a leader among her classmates. She was able to follow simple directions and complete simple work tasks with repetitive practice and hands-on experience. She was able to read simple personal care and job related words and recognized 33 “survival” signs. She could tell time on the hour, count by 1s to 50 and 10s to 100. She could locate items in a store and arrive and depart from various destinations in the community using the city bus system. Her needs included: (a) money management; (b) purchasing using the next dollar strategy; (c) comparing prices; (d) following picture recipes; and (e) cleaning her bedroom. She had no current work history. She enjoyed music, shopping, and talking on a telephone.

Settings and Instructional Arrangements

Multiple step job tasks were defined in the study as the separate behavioral chained jobs that comprise the duties of a job title. Three multiple step job tasks were selected which comprised the job title of “office manager” which were being completed by graduate assistants at the university setting. The three multiple step job tasks were: watering a plant; delivering mail; and changing paper towels in a student restroom. Each job task was comprised of a set of chained multiple steps of a task analysis. Jobs selected were currently performed by graduate assistants or identified as ones that would assist one of the office managers in the department of education. Each job task was taught via computer-based video instruction (CBVI). The dependent variable was physical completion of the step of the task analysis during generalization sessions at the job site.

All instructional sessions were individually implemented using CBVI in a small office space on the second floor of the education building on the local university campus where the TPYA program was located. During instructional sessions, a laptop computer with touch screen was placed on the office conference table in front of the student. The instructor sat to the right of the student and when present, the reliability data collector sat approximately 3 ft behind the student. During generalization sessions the instructor walked approximately 6 in. behind and to the left of the student and the reliability data collector walked approximately 2 ft behind the instructor.

Generalization sessions occurred individually at the job site within three floors of an 80,500 square foot education building. The job site was selected due to the ability of students to perform tasks following study completion and increased inclusion of students within building activities.

The plant was located in the south end of the third floor atrium. The office containing the envelope to be delivered was located on the south end of the second floor through a set of double doors and behind one glass door. The envelope was placed on a table next to the office desk. The envelope was delivered to the information counter on the south end of the first floor The student restroom was located in the middle of the first floor and down a corridor which contained the student lounge. Paper towels were placed on top of a cabinet in the restroom. Two elevators were located in the middle of the atrium with accessibility on each floor.

Materials and Equipment

Equipment. A *Dell Latitude 300* laptop computer was used to teach job skills via computer-based video instruction. The instructional programs were created using the software program *PowerPoint.* Video recordings (with sound) and digital still photographs of each step of the task analysis for each job task were made using a *Sony* digital video camera. Steps were video recorded separately and then edited using *Windows Movie Maker* and saved on CD-ROM. Students selected photographs on the computer screen using a *Magic Touch* touch screen (Keytec, Inc). Target (correct) photographs were hyperlinked to digital video clips that automatically played the step of the task analysis corresponding to the photograph (Table 1). The *Power Point* program was pro-

Figure 1. Power Point slide of 3 photographs. Target photograph, representing correct step of the task analysis, was hyperlinked to digital video clips that automatically played the step of the task analysis corresponding to the photograph.

grammed to advance to the next slide "on a click" (touch of the computer screen) which automatically played a video recording of the task step (e.g., video recording of turning left upon exiting the elevator was shown when the student selected a photograph showing the scene left of the elevator) (Figure 1). The video then stopped and the program automatically advanced to the next slide containing three photographs. The program remained on the photograph slide until the student touched the correct photograph corresponding to the next step of the task analysis.

Video recordings. Video recordings were made using subjective point of view (Norman et al., 2001) as if the student were completing the step or using video models (Table 1). Using subjective point of view, video segments were created by moving the camera as if it were the student and showed what the student would be seeing (i.e. walking down the hall). Video models showed the instructor complet-

TABLE 1

Task Analysis of Three Job Skills and Computer Stimuli

Target Stimuli: Photograph on Computer Screen	*Response: Step of Task Analysis; Video Recording*
Job Skill 1: Water plant	
Elevator	Walk to elevator
Inside elevator floor panel	Touch "3"
Scene to left of elevator on 3rd floor	Turn, walk to left
Plant	Walk to plant
Water bottle	Water plant
Job skill 2: Deliver Mail	
Elevator	Walk to elevator
Inside elevator floor panel	Touch "2"
Scene to left of elevator on 2nd floor	Turn, walk to left
Table in office	Walk to table
Envelop on table	Put envelop in bag
Elevator	Walk to elevator
Outside elevator "up/down" panel	Touch "down" arrow
Inside elevator floor panel	Touch "1"
Counter on 1st floor	Walk to counter
Envelope on counter	Put envelope of counter
Job Skill 3: Change Paper Towels	
Restroom door	Walk to restroom
Empty roll of paper towels	Put empty roll of paper towels in bag
Full roll of paper towels	Put full roll of paper towels on top of cabinet
Classroom door	Walk to classroom

ing a step such as pushing a button on the elevator panel to select the second floor.

Materials. During job site generalization sessions students were given a 24 in. canvas bag with strap that contained a plastic bottle filled with water for watering the plant and one roll of paper towels without the plastic wrap. An empty roll of paper towels was placed in the student restroom on the first floor and a legal size envelope was placed on the table in the office manager's second floor office prior to each generalization session.

General Procedure

Students were individually instructed using a 3 s constant time delay (CTD) procedure and computer-based video instruction (CBVI). Instruction occurred four afternoons per week. Each session consisted of three trials. Three CBVI conditions were implemented with a new job task added during each condition thus increasing the difficulty level of the job title until three job tasks were completed. CBVI – 1 (watering plant) lasted approximately 6 min per session (2 min x three trials); CBVI – 2 (watering plants and delivering mail) lasted approximately 18 min (6 min per trial); and CBVI – 3 (watering plant, delivering mail, and changing paper towels) lasted approximately 24 min (8 min per trial). As criteria (100% unprompted correct selections for one session) were reached for a CBVI condition, three generalization probe sessions were conducted at the job site. Following these generalization probe sessions, instruction began on the next job task in conjunction with previous job task(s).

Job Site Generalization and Maintenance Probe Procedures

Three probe sessions for each of the three job tasks were conducted at the community-based job site prior to computer-based video instruction. During the first CBVI condition the first job task (watering a plant) was taught. During the second CBVI condition two tasks were taught (watering a plant and delivering mail). The third CBVI condition included all three tasks (watering a plant, delivering mail, and changing paper towels) thus gradually increasing the difficulty level of the requirements comprising the job title of office manager/graduate assistant. For generalization probe conditions at the job site all three job tasks were evaluated. Following each CBVI condition students returned to the community job site and were evaluated across three sessions on their ability to generalize completion of the steps of the task analysis for three job tasks.

Each probe sessions began outside the TPYA classroom on the first floor of the education building. The student was given the canvas bag containing the water bottle and paper towel roll and told, "It's time to water plants, deliver mail, and change the paper towels." Students were evaluated on the chain of steps for each job task as listed in Table 1. For each step in the chain, the student could perform the step correctly, incorrectly, or not respond. No responses were defined as failure to initiate the next step of the chain within 3 s of the previous step completion. Incorrect responses were defined as initiating a step out of sequence or initiating a step in correct sequence but failing to complete the step correctly. A correct response (unprompted correct) was defined as initiating a motor response in correct sequence within 3 s of the previous step and completion of the motor response within 10 s of the previous step. Incorrect or no response resulted in skipping the step (e.g., not putting the envelope on the counter) or the instructor performing the step out of view of the student if subsequent steps were dependent on the step (e.g. holding a folder in front of the elevator button panel and pushing the "2" for the second floor).

Students received non-specific verbal praise such as, "You're doing a nice job," on the average of one time per job task for general attending and attempts to complete the task. At the end of the task the student was verbally reinforced by the instructor to the TPYA teacher with the student present.

Maintenance data were conducted 116 days after the final probe session for Jacob, 118 days for Arnold, and 124 days for Shelly. Maintenance probe sessions were conducted identical to generalization sessions.

Computer-Based Video Instruction (CBVI)

Following the first probe condition at the community job site, CBVI began for each student. Each session began with the instructor gaining the students attention, directing use of the touch screen to make selections, and delivering the task direction specific to which job tasks were to be taught (i.e., "It's time to practice watering the plant and delivering mail on the computer." Still digital photographs and video recordings were made for each step of the task analysis for three job tasks (Table 1). During instruction students were presented with an array of three different photographs on the computer screen from which they selected the one that corresponded to the next step of the task analysis to complete the job task (Figure 1). Intervention using CTD began with a 0 s delay. Each student remained at 0 s until 100% correct wait responses (correct responses after the instructor prompt) for one session (three trials). The controlling prompt for each student was the instructor pointing to the correct photograph on the computer screen. Correct wait responses (touching the photograph) resulted in viewing of a video recording demonstrating completion of the corresponding step of the task analysis. Video recordings, still photographs, and student responses occurred in the following sequence: (a) 3 still photographs of possible task steps appeared on computer screen; (b) selection (touching) correct photograph of the step to be completed in the sequence of the task analysis; (c) video segment of correct performance of the step. Following 0 s delay trials, CTD trials implementing a 3 s delay interval were provided. Using the CTD procedure a student response was recorded as: (a) unprompted correct (initiating and touching the correct photograph within 3 s of the screen appearing); (b) unprompted incorrect (touching an incorrect photograph with 3 s of the screen appearing); (c) prompted correct (touching correct photograph after the instructor prompt; (d) prompted incorrect (touching an incorrect photograph after the instructor prompt); and (e) no response (failure to initiate touching the photograph within 3 s of the instructor prompt. An unprompted or prompted correct response was followed by the computer program advancing to the next slide which showed a video recording of the step of the task analysis being completed. An unprompted incorrect response was followed by the instructor pointing to the correct photograph. A prompted incorrect or no response was followed by the instructor touching the correct photograph and advancing the slide to the video screen.

Experimental Design

A multiple probe design across three job tasks and replicated across three students (Tawney & Gast, 1984) was used to evaluate effectiveness of CBVI to teach job skills. Multiple steps of each job task were individually taught to each student using constant time delay and the computer-based program. Prior to instruction, probe measures were conducted for all three job tasks for a particular student over three sessions at the job site. Probe measures were followed by instruction of the first job task, CBVI-1 (watering a plant) with the computer program. When criterion (100% independent correct for one session) was reached for a student, generalization probe measures were again collected for all three job tasks at the job site followed by CBVI-2, instruction on the second job task (delivering mail) plus the first job task (watering a plant). This in vivo probe and CBVI format continued until the student reached criterion on all three job tasks using CBVI.

Reliability Measures

Interobserver agreement and procedural reliability data were simultaneously collected on 33% of all probe and CVBI sessions. The reliability observer was present during these sessions. Interobserver agreement was reported for each step of the task analysis using the point-by-point method in which number of instructor and observer agreements was divided by number of disagreements and multiplied by 100. Procedural reliability data were collected on the following instructor and computer behaviors: (a) delivery of attentional cues; (b) ensuring attentional response; (c) delivery of task direction; (d) delivery of controlling prompt (CBVI only); (e) error correction (CBVI only); (f) advancement of computer program to next slide; (g) delivery of intermittent verbal reinforcement; and (h) blocking student view of task steps completed by instructor (job site). Procedural reliability agreement was determined by dividing number of observed instructor behaviors by number of opportunities to emit the behaviors, multiplied by 100 (Billingsley, White, & Munson, 1980).

Results

Reliability

Mean interobserver agreement was 99.6% across all participants and conditions, 99.7% for CBVI (range = 93.3-100) and 99.6% for generalization job sites (range = 94.7-100). Disagreement during CBVI was due to students correcting their own errors while disagreement during generalization sessions was due to students walking straight off of the elevator (rather than turning left) but still arriving at the correct destination. Mean procedural agreement was 99.6% across all participants and conditions, 99.8% for CBVI, and 98.5% for generalization sessions. Procedural disagreement was due to: (a) the instructor delivering the wrong controlling prompt (touching the photograph on the computer screen rather than gesturing); (b) computer program advancing to the wrong video caption; (c) a passenger in the elevator asking Jacob if he wanted the second floor and Jacob answering, "yes" rather than pressing the floor number himself; (d) someone removing the empty roll of paper towels before Arnold arrived; and (e) the corridor door near the second floor office being closed during one generalization session.

Effectiveness

Figures 2, 3 and 4 show the effectiveness of CBVI to teach students to complete multiple step job tasks. Data are reported for initial probe sessions at the job site, CBVI, generalization of skills to the actual job site, and maintenance of skills.

Results for all students indicate that CBVI using CTD was effective in teaching students with moderate intellectual disabilities to complete chained steps comprising the multiple step job tasks of "office manager". During initial generalization probe sessions, the mean percentage of steps correctly completed across all three students and three job tasks was 9.9%. Shelly was unable to perform any of the steps while Arnold performed up to 20% of the steps for delivering mail and Jacob performed up to 25% of the steps for changing the paper towels. Following CBVI-1 (watering plants) the mean percentage of steps correctly completed across all three students at the generalization job site was 100% for watering plants and remained low for the other two job tasks. The number of required steps increased during each condition of CBVI. Following CBVI-2 the mean percentage of steps correctly completed across all three students at the generalization job site was 97% and 96.5% following CBVI-3. As more job tasks (more steps) were added in CBVI-3, Jacob committed errors in previously learned tasks (turning left when exiting the elevator) while Shelly increased the percentage of correct steps for delivering mail following CBVI-3 compared to CBVI-2. Arnold never initiated walking to the restroom following CBVI-3, but continued to complete 100% of the steps for watering the plant and delivering mail.

Maintenance data were collected approximately four months following the last generalization probe session. Jacob correctly completed 100% of the steps across three job tasks after 116 days. After 118 days Arnold completed 84.2% of the steps correctly while Shelly completed 89.5% of the steps correctly after 124 days.

Efficiency

Jacob and Arnold required a total of 15 CBVI sessions to meet criterion for three multiple step job tasks while Shelly required 21 CBVI sessions to criteria. She was the only student who committed errors during CBVI following delivery of the controlling prompt (instructor pointing to photograph on the computer screen) however; she only committed .6% prompted incorrects (2 errors) by touching an incorrect photograph. Only 2.8% errors were committed across all three students during generalization sessions following CBVI. The step that received the greatest percentage of errors (1.1% across all three students) was turning left when exiting the elevator.

Discussion

The current study evaluated the use of CBVI to teach multiple job skills in a simulated en-

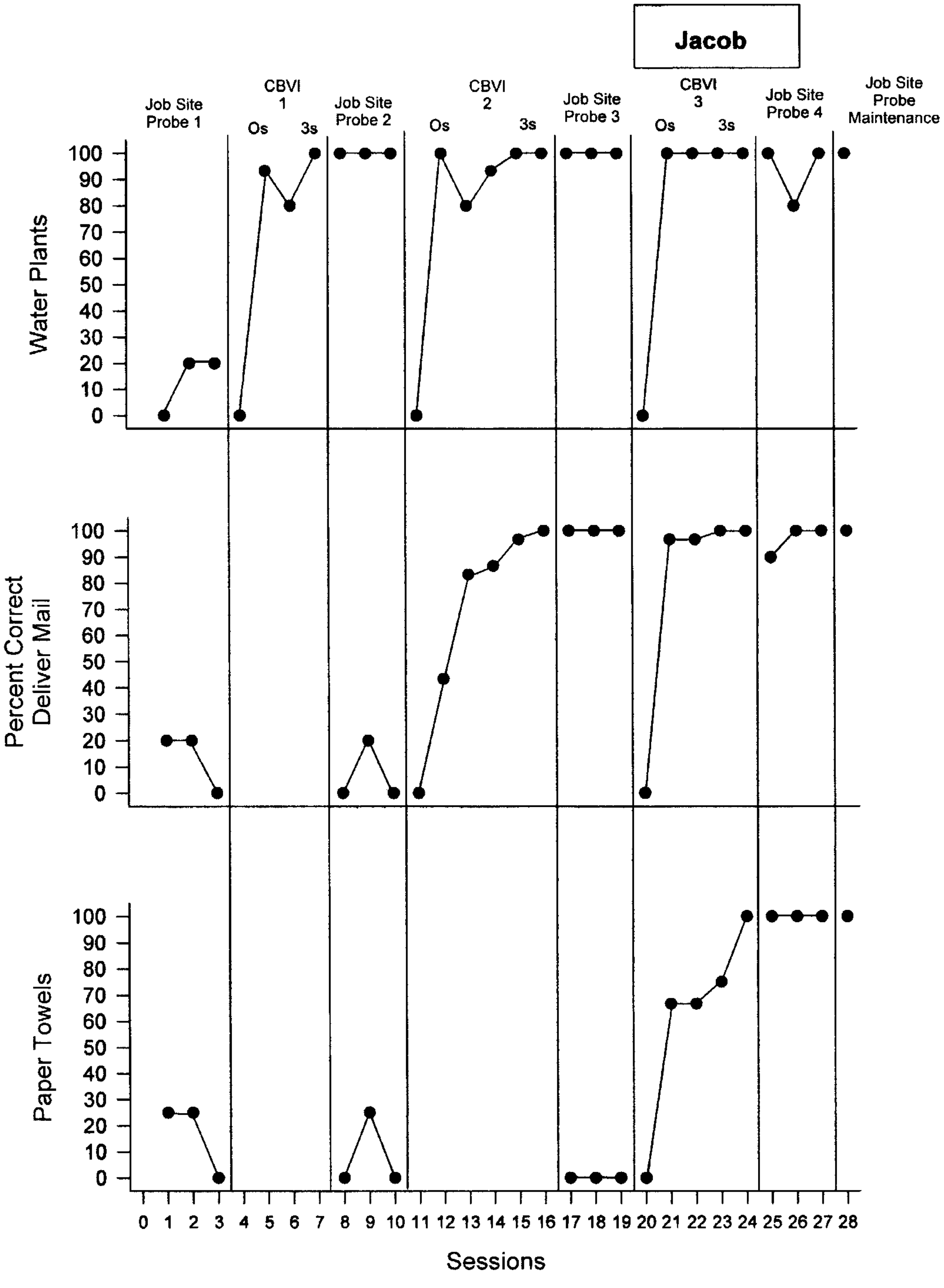

Figure 2. Graph of Jacob's performance across three job tasks.

vironment to young adults with moderate intellectual disabilities. Simulations of employment tasks were created by video recording the steps of the task analysis and presenting

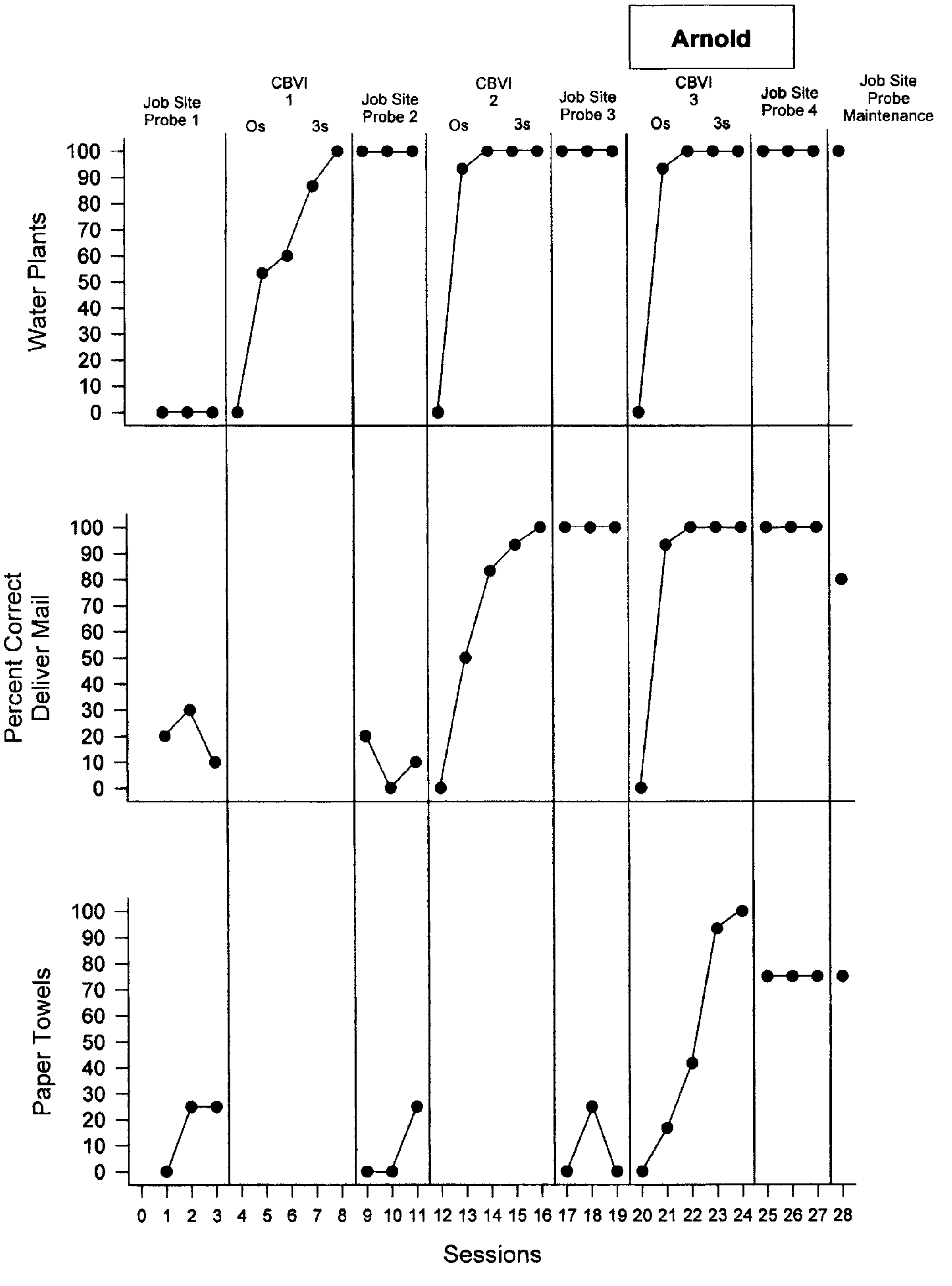

Figure 3. Graph of Arnold's performance across three job tasks.

instruction through an interactive computer-based program. Implications resulting from the study are that combining the effects of video and computer-based instruction can be

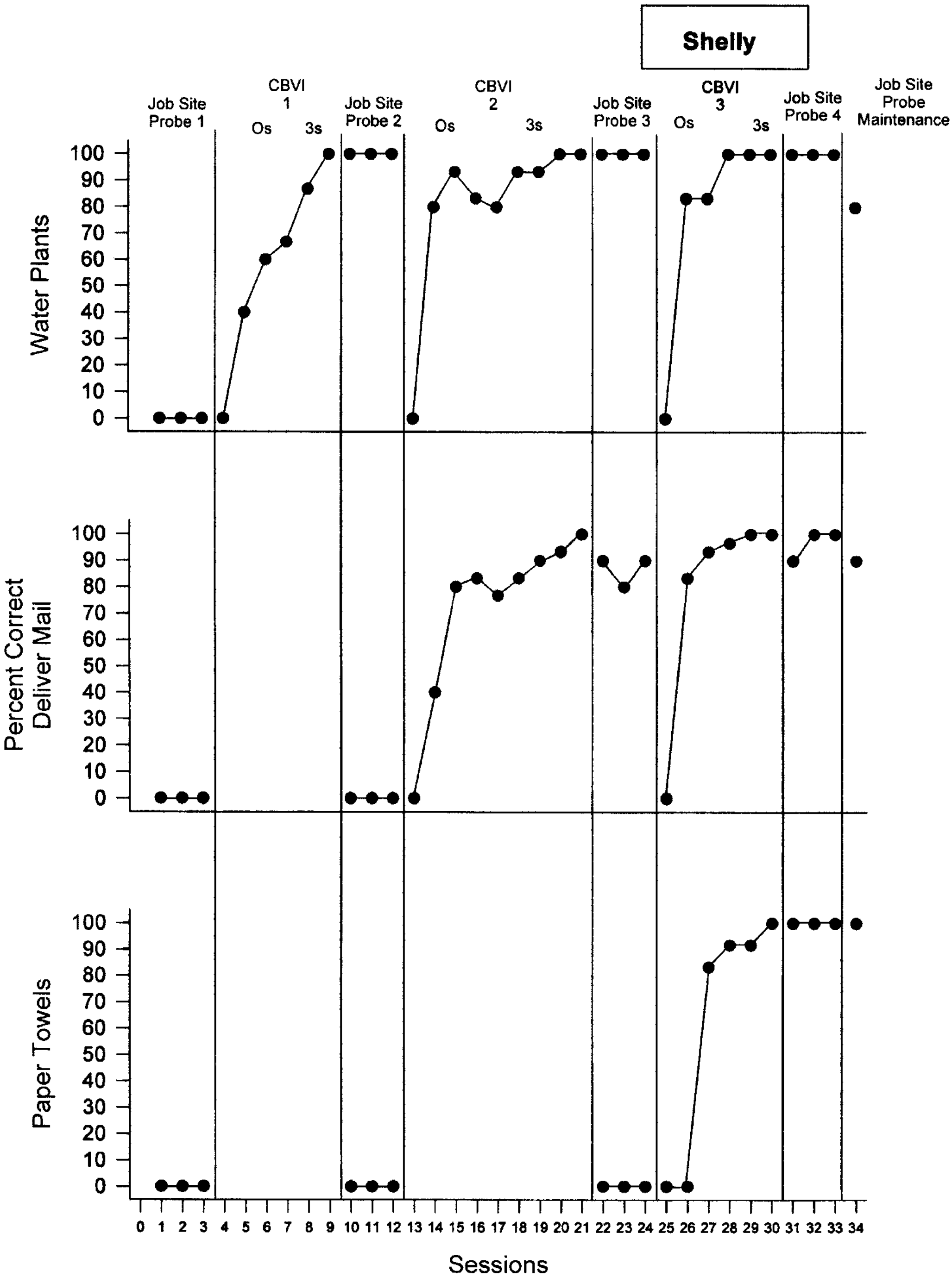

Figure 4. Graph of Shelly's performance across three job tasks.

an effective means to teach job skills to persons with disabilities.

CBVI can be used to provide presentation of multiple examples, which teachers may otherwise have difficulty making available to students on a consistent, repetitive manner through limited community-based instruction (Mechling, 2005). Results of the current study demonstrated that simulations effectively replicated the relevant stimulus and response variations of the natural job setting. Instruction that occurred exclusively through CBVI, resulted in 96.5% correct performance of steps across three job tasks and three students during the final generalization probe at the job site.

Although results are supportive of this technology, some limitations to the study exist. While the current study included multiple tasks, it limited the number of job tasks to three. To successfully obtain and maintain competitive employment, job skills will likely require more than three component tasks. Further, the tasks remained consistent throughout the study. A difficulty frequently reported as contributing to loss of employment is the inability of employees to adjust their behavior to respond appropriately to novel or varying task requirements and environmental conditions (Berg et al., 1990; Rusch et al., 1986). Future studies should include variables that change during CBVI to more closely replicate changes that can be encountered in the natural work environment.

Future investigations should also examine use of self-instructional techniques such as written, pictorial, or symbol lists in conjunction with CBVI to increase job complexity. Combined with CBVI, these strategies which have been identified as effective in promoting independent task completion (Allen et al., 1992; Steed & Lutzker, 1997) may further support development of competitive job skills for persons with intellectual disabilities.

Although the purpose of the study was not to evaluate use of a controlling prompt delivered by the computer, if teaching staff desire a program that students can operate independently, technology makes it possible for prompts to be delivered by the computer (i.e., slide with three photograph selections advances after 3 s to slide with only the photograph of the correct response). Further investigations should evaluate incorporation of these features as measures of efficiency.

The unemployment rate among persons with disabilities continues to be high (Davies et al., 2004). In order for persons with disabilities to increasingly support themselves they must possess vocational skills which result in gainful employment (Chandler et al., 1993). Failure to acquire these skills prior to graduation from high school may lead to low level semiskilled positions, underemployment, low earnings, job dissatisfaction, and/or placement within sheltered employment positions.

The current study is the first to demonstrate computer-based video instruction to be an effective means for teaching job skills to students when on site instruction is not readily available. This technology can effectively place a student in real-life, interactive simulations, which may well be at this time one of the best alternatives available to educators for simulating the visual and auditory stimuli of the natural environment and the response variations required of the learner. Future innovations may wish to evaluate use of this technology to further individualize instructional programs to meet the unique needs of students. For example settings in a student's distant neighborhood can be presented on video rather than instruction being restricted to community sites that happen to be close to the school.

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