The Effect of Instructor-created Video Programs to Teach Students with Disabilities: A Literature Review

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This paper summarizes the results of a review of the empirical literature (1999-2003) focusing on the use of instructor-created video recording incorporating personalized video to teach individuals with disabilities. Twenty-four investigations were identified which provided information on several effective procedures. Six areas of research on instruction through video technology were defined and analyzed through the identified studies: (a) video feedback, (b) video modeling, (c) video self-modeling, (d) subjective point of view, (e) interactive video instruction, and (f) computer-based video instruction. Implications of the research and suggestions for future research are discussed.

Research and development on the use of technology for instructing students with disabilities has experienced a considerable increase since the early 1980s (Woodward & Reith, 1997), including interest in applications of video technology. One form of video technology uses instructor-created video recordings incorporating personalized video, which are individually meaningful to the learner. As presented in this review of the literature, many research projects have shown this technology to be an effective means for delivering instruction to persons with disabilities.

Operating primarily through the premise of observational learning, learning by watching others, and imitation of observed behaviors (Clark, Kehle, Jenson, & Beck, 1992), video technology can provide multiple examples of stimulus and response variations across a variety of settings that closely resemble the natural environment where the student will be performing the skills (Wissick, Gardner, & Langone, 1999). More specifically, instructor-created video recordings can be inherently culturally sensitive (Buggey, 1995) by creating personalized models with which learners can relate. These videos have been shown to serve as a realistic means for providing instruction through a medium which provides simulations closely replicating real-life scenarios, incorporating both visual and auditory features relevant to the learner.

Added advantages of video technology include: (a) repeated observations of the same model, (b) reuse across a variety of instructors (Charlop-Christy, Le, & Freeman, 2000), (c) review at later dates, as often as needed, for maintenance of skills (Le Grice & Blampied, 1994), and (d) use outside of the classroom, in a variety of settings that may include home environments. Immediate feedback, repetition of instructional trials, and the reinforcement quality of video technology have also been reported to contribute to its positive effects. Information, presented through this technology, can offer a cost efficient format for delivering instruction (Branham, Collins, Schuster, & Kleinert, 1999) with implementation by a paraprofessional or independently by the student.

The review focused on studies that used video programs created by the researcher (rather than commercially available software) which addressed the individualized needs of the learners. This technology primarily incorporated the use of video recordings created by the instructor or researcher, which served as feedback, models, or prompts for the learner. Learning was through observation of a videotape, role playing, or an interactive program with presentation of the video medium through a VCR or a computer-based program. Although the majority of studies to date have relied on the use of a VCR to deliver instruction, promising new studies are evaluating the effects of multimedia, computer-based programs with interactive features.

The purpose of this literature review was to examine the published, empirical literature evaluating instruction for persons with disabilities through the use of instructor created video programs. The programs included: (a) the student as a self-model, (b) familiar adults and peers as models, (c) video captions of activities, or (d) completion of tasks as if the student was performing them. The review found the use of the technology to be primarily effective in teaching a range of skills to persons with disabilities including: social communication, grocery shopping, transitioning, grooming, self-determination, and money skills. The first section of the paper reviews these instructional procedures and the results of the studies while the discussion section addresses questions raised from the studies and directions for future research.

METHOD

Research articles were located by conducting an electronic and ancestral search of journals focusing on the education of persons with disabilities from 1999-2003. The electronic search included ERIC and Psychological journals. Keywords used for locating articles were: videotapes, video feedback, video technology, video modeling, self-modeling, video-self modeling, modeling, multi-media, computer-based instruction, and computer-based, video instruction. Next, a manual search was conducted of the journals listed in Table 1. Finally, an ancestral search was made of the reference lists of obtained articles.

In order to be included in the review, studies met the following criteria:

1. Participants were diagnosed with a disability (according to definitions outlined by Individuals with Disabilities Education Act (IDEA) and Sections 504 of the Rehabilitation Act of 1973.
2. Evaluation of instructor-0created videos for teaching skills.
3. Use of an experimental design.
4. Publication in a peer-reviewed journal.

Although additional studies, using commercial software programs incorporating video (Goldsworthy, Barab, & Goldsworthy, 2000), and feature films made for media such as television (e.g., Ferretti, MacArthur, & Okolo, 2001; Glaser, Rieth, Kinzer, Colburn, Peter, 2000; Xin & Rieth, 2001), were identified, they were not included in this review, which focused on the effects of instructor-created video programs. In addition, reports using pilot studies, projects, position papers, or an AB design were excluded.

Table 1.
Journals Reviewed

Behavior Disorders
Behavior Modification
Behavior Therapy
Child and Family Therapy
Education and Training in Developmental Disabilities
Education and Treatment of Children
Exceptional Children, Exceptionality
Focus on Exceptional Children
International Journal of Disability
Development, and Education
Journal of Abnormal Psychology
Journal of Applied Behavior Analysis
Journal of Autism and Developmental Disabilities
Journal of Developmental and Physical Disabilities
Journal of Early Intervention
Journal of Learning Disabilities
Journal of Special Education
Journal of Special Education Technology
Journal of the Association for Persons with Severe Handicaps
Language Speech and Hearing Services in Schools
Learning Disabilities Quarterly, Learning Disabilities Research and Practice
Remedial and Special Education
Topics in Early Childhood Special Education
Topics in Language Disorders.

RESULTS

From this search, 24 studies were identified and included in the review. In addition to these studies, a literature review on video self-modeling by Hitchcock, Dowrick, and Prater (2003) and a review of self-modeling (including video self-modeling) (Dowrick, 1999) were identified. Studies identified in those reviews, dating from 1970-2001, were not repeated in the current review. Each study was evaluated to determine (a) the number, age, and disability level of the participants, (b) type of video technology applied, (c) dependent variable, (d) experimental design, and (e) results of the study. Of the 24 studies reviewed, 45.8% included students with mental retardation, 54.2% with autism, 12.5% with emotional and behavior disorders, 8.3% with attention deficit hyperactivity disorder (AD/HD), 4.2% with learning disabilities, and 4.2% with physical disabilities. Interventions targeted measures of: communication (7 studies), community skills (6 studies), behavior-related skills (5 studies), social skills (3 studies), self-help skills (2 studies), and daily/home living skills (1 study). Thirteen studies included measures for maintenance while 16 studies reported measures of generalization. Articles focused on six procedures for delivering instruction through video technology. This review is organized according to those procedures which include: (a) video feedback (4 studies), (b) video modeling (6 studies), (c) video self-modeling (3 studies), (d) subjective point of view (2 studies), (e) interactive video instruction/video prompting (3 studies), and (f) computer-based video instruction (7 studies).

Video Feedback

Video feedback, sometimes referred to as video replay (Raymond & Dowrick, 1993), provides learning through viewing one's own performance of a past or recent task on an unedited videotape (Dowrick, 1999). Students can assess their performance of a task, including errors, and adapt future performance in response to the feedback. This procedure has often been used in conjunction with self-evaluation measures in which students observe a video of themselves performing a task and record whether a behavior did or did not occur.

Appropriate social behaviors were taught to students with a primary diagnosis of mild mental retardation in three related studies using video feedback. Embregts (2000) evaluated a video feedback and self-management package to decrease inappropriate behaviors of six adolescents with mild mental retardation and associated diagnosis of AD/HD with oppositional defiant disorder or pervasive developmental disorder. Target behaviors included: reacting to criticism with violence (e.g., hitting and pushing, making threatening remarks and/or insulting statements), screaming, and throwing objects. A decrease in the percentage of intervals of inappropriate behaviors during these sessions was reported although response generalization did not occur for non-target behaviors, nor did the researchers evaluate generalization to other settings outside the residential facility.

Embregts (2002) further applied the video feedback and self-management package with 5 adolescents with mild mental retardation to increase appropriate social skills and decrease inappropriate behaviors. Procedures for baseline and intervention replicated the previous study (Embregts, 2000). This study, however, used a reversal baseline design. Only 2 participants showed a decrease in inappropriate behaviors from the first baseline to first intervention phase, however all 5 participants showed decreases in inappropriate behaviors from the first baseline to the second intervention phase. No reversal effect was found. Although the researchers state the lack of baseline reversal as a limitation to the study, it is likely that the behaviors were learned and withdrawal of the intervention did not effect this change.

Results of the two previous studies were later extended to students exhibiting internalizing behaviors using a similar self-management package with video feedback (Embregts, 2003). The procedure showed greater effects with externalizing over internalizing behaviors. Interestingly, these results were partially attributed to the ability of video feedback to provide clear visual cues on the performance or nonperformance of physical, externalizing, behaviors whereas internalizing behaviors (i.e., unresponsiveness, unassertiveness) were described as being less clearly defined visually. Data did not indicate significant effects during a long term follow-up period for either type of behavior for the 4 students evaluated.

Social communication skills were the focus of a fourth study (Thiemann & Goldstein, 2001) which also examined video feedback as part of a treatment package. Dependent measures, (a) contingent responses, (b) securing attention, (c) initiating comments, and (d) initiating requests, served as subject matter for social stories and cue cards to increase the skills of 5 students with autism. Results showed increases in three targeted social communication skills for 3 students and two skills for the other 2 students when the intervention package was implemented. Effects generalized across untrained social behaviors for 2 students and 1 student generalized effects from the media (treatment) room to the classroom setting. Data did not support maintenance of skills when visual cues were removed.

Although data support the use of video feedback as an instructional tool, each evaluation used a treatment package rather than examining the isolated effects of video feedback. Interventions were multifaceted, preventing conclusions concerning the exact contributions and benefits of the individual strategy(ies). Nevertheless, results suggested positive effects on social and communication skills when video feedback of participants' actions were provided in conjunction with approaches such as self-management. The ability to view one's actions at a later date appears to be an effective tool for self-evaluation for both decreasing unwanted behaviors and increasing desirable behaviors. A significant factor in behavior change, as presented by Embregts (2003), may be the ability of video to adequately present behaviors visually. Those behaviors not overtly displayed (internalizing behaviors) may require alternative interventions incorporating auditory and descriptive features.

Video Modeling (VM)

Video modeling (VM) presents the performance of a skill by a model such as a same-age peer or adult without a disability. The learner watches a video demonstration of a skill and is then required to perform (i.e., imitate) the skill at a later time (Haring, Kennedy, Adams, Pitts-Conway 1987). The use of video modeling has been evaluated to teach play-related sequences (D'Ateno, Mangiapanello, & Taylor, 2003); communication (Charlop-Christy et al., 2000); perspective taking (Charlop-Christy & Daneshvar, 2003; LeBlanc et al., 2003); and play-related comments to siblings (Taylor, Levin, & Jasper, 1999).

Play comments were the focus of two studies by Taylor et al. (1999) using VM with 2 children with autism. In the first study, the participant viewed scripted only play comments between his sibling and an adult on video. Instructional sessions included viewing of the videotape plus interaction with an adult who read the script and reinforced verbalizations by the child. Results revealed that the child learned to make scripted comments across 3 different play activities. The intervention did not lead to any unscripted comments. In the second study a longer series of scripted comments was modeled between a sibling and an adult and included the sibling making unscripted comments. Results from each study demonstrated that VM was effective in increasing scripted play comments toward siblings although unscripted comments were only demonstrated when modeled in the second study. It should be noted that both studies included instructional sessions with an adult, therefore the effects can not be attributed to VM alone.

Play-related comments and imaginative play skills were the focus of a study by D'Ateno et al. (2003) implemented with a 3-year, 8-month old girl diagnosed with autism. Experimental control was demonstrated through a multiple baseline procedure across three play activities (i.e., tea party, shopping, and baking). Dependent measures included scripted verbal responses, novel verbal responses, modeled motor responses and not-modeled motor responses. Video models were made using an adult who spoke to a doll following scripted verbal statements and manipulation of toys. Although limited to 1 participant, the study indicated that VM led to increases in both scripted verbal responses and modeled motor responses. The number of novel verbal responses and not-modeled motor responses remained low following VM which was attributed by the experimenters to a lack of sufficient play exemplars (only one video model was presented per play activity).

Evaluation and instruction of perspective-taking skills (i.e., understanding another person's beliefs in order to predict behavior) for children with autism has received recent attention in the literature. LeBlanc et al. (2003) used VM combined with reinforcement while Charlop-Christy and Daneshvar (2003) evaluated VM alone to teach perspective-taking skills to students with autism by using videotapes featuring familiar adults performing the perspective-taking tasks. Adults correctly modeled the answers to questions and explained problem-solving strategies that were later presented to the participants. Both studies indicated that VM was a fast and effective means for teaching perspective-taking skills. In addition to VM, Charlop-Christy and Daneshvar attributed generalization to the use of multiple exemplar training.

A comparison study (Charlop-Christy et al., 2000) examined the effects of live, in vivo models and VM with 5 children with autism. Acquisition and generalization measures included (a) expressive labeling of emotions (e.g., happy versus sad), (b) independent play (e.g., coloring), (c) cooperative play (i.e., card games), (d) social play (e.g., group motor games such as Number Tag, (e) spontaneous greetings, (f) conversational speech, (g) oral comprehension ("wh" questions), and (h) self-help skills. Video models were created with familiar adults performing the tasks at an extremely slow pace either on video recordings or in vivo. Tasks were randomly assigned to either the video or in vivo condition with relatively equal difficulty levels across the two tasks. Video modeling resulted in quicker acquisition of skills for 4 of the 5 students and was reported to be more time and cost efficient than in vivo modeling, requiring 170 cumulative minutes compared to 635 cumulative minutes of teaching with in vivo modeling. Generalization across settings, persons, and stimuli occurred only for skills taught through video modeling.

Results of the studies suggest that VM is both an efficient and effective means for teaching a variety of skills. Unlike the studies using video feedback, the majority of VM studies evaluated the effects of VM when presented alone as an instructional tool. Each study was conducted with students with autism. Positive effects for children with autism were noted and contributed to the ability of video captions to zoom in closely to relevant stimuli and cues in order to overcome stimulus over selectivity by this group of students (Charlop-Christy et al., 2000). Additionally, watching video models may be highly reinforcing to students with autism who prefer to watch television and to repeatedly watch segments over and over again. Charlop-Christy et al. (2000) further note the effectiveness of VM for children with autism due to its ability to remove the student from uncomfortable social contacts with adults. It is also noteworthy that each study used adult models, one included both adults and children, and none used children alone to produce the video models. Although Charlop-Christy and Daneshvar (2003) reported that research has shown adult models to be as effective as peer models, it appears these results are referring to studies with live, in vivo models, as no such comparisons were noted in the reviewed research with video instruction. It may therefore be of importance in future research to directly compare the effects of both types of models when using VM. Finally, positive generalization of skills were attributed in part to the use of multiple exemplar training, an advantage characteristic to the features of video technology.

Video Self-Modeling (VSM)

Video self-modeling (VSM) is a second form of video modeling in which the learner serves as the key character of the video. VSM allows participants to view themselves performing a task at a more advanced level than they typically perform the skill (Buggey, Toombs, Gardener, & Cervetti, 1999). A reported advantage of VSM rather than others as models is the reinforcing value of viewing oneself successfully completing tasks. Self-modeling may increase self-efficacy (Bray & Kehle, 1996), provide students with the intrigue and enjoyment of seeing themselves on video (Holmbeck & Lavigne, 1992), and establish an appropriate model with the greatest degree of similarity to the learner (Brown & Middleton, 1998; Holmbeck & Lavigne, 1992).

Dowrick (1999) describes two sub-classifications of self-modeling: positive self-review (PSR) and *feedforward*. Using PSR, video self-models are created by providing best case performances of a skill by the learner. Positive self review, as a form of self-modeling, can be created by editing video tapes to remove student errors to show a desired performance of a behavior. The student then views himself/herself performing the advanced behavior (Meharg & Woltersdorf, 1990). Dowrick reports this procedure to be effective in increasing behavior, which is below the desired rate, or which has regressed to a lower level (i.e., forgotten over time).

Feedforward creates video self-models of skills not yet performed by an individual or ones that have not been performed across different contexts (Dowrick, 1999). Individuals may already perform some subskills of the task (e.g., some steps of a cooking or vocational task), but not be able to perform the entire task in sequence. Individual steps are video taped and then edited to produce the complete model of the steps. Students view themselves "as they might behave in the future rather than simply how they are at the time (feedback)" (Woltersdorf, 1992).

Feedforward may further be created by editing videotapes of a skill (i.e., transitioning to an activity) so that it appears the individual is performing the task in a different setting. No new skills are performed, but rather a routine activity is performed in a new setting or with different people. Dowrick (1999) also describes feedforward as a form of role playing if the segments of videotape are edited into a larger sequence containing context, behavior, and outcome.

In a recent review, Hitchcock et al. (2003) reported moderate to strong outcomes for the use of VSM as an intervention tool for communication, behavior, and academic performance for students with disabilities in educational settings. Three studies were identified in addition to those included in the Hitchcock et al. review and are summarized in this section.

Similar to the research results with VM, investigations by Buggey et al. (1999) and Sherer et al. (2001) support the use of VSM to increase the communication skills of children diagnosed with autism. Buggey et al. measured the effects of VSM on acquisition and maintenance of appropriate verbal responses to questions by 3 children ages 7 to 12 years while Sherer et al. (2001) compared 5 children's abilities to answer questions through a self-as-model video condition and other-as-model video condition. All three children In the Buggey et al. study showed an increase in appropriate responses to questions such as, "What is your favorite food?" that almost doubled their rates of appropriate responses during play situations and decreased in responding when VSM was withdrawn for each participant. Results of the Sherer et al. study were variable between participants. Measurement of percentage of correct engagement indicated participants learned the skills equally well with both conditions and demonstrated no overall difference in the rate of acquisition of conversation skills between the two conditions.

Positive results were also demonstrated with VSM for increasing spontaneous responding (SR) in a study by Wert and Neisworth (2003). Defined as independently asking for an object or action, SR was evaluated across 4 young children with autism using a multiple baseline design. Videotapes were made during home play sessions and edited to remove adult prompts (e.g., withholding materials and asking questions) and modeling of requests. Following VSM, an increase in SR was reported for each student. Increases ranged from a lowest mean effect of less than 1 SR per 30-minute baseline period to a mean of 10.2 following VSM for 1 participant to the highest mean effect of 2.7 to 17.5 SRs for a second participant.

Although the outcomes are positive for the majority of the studies reviewed in this section, some interesting questions emerge. Is it likely that results will differ depending not only on the procedure used, but the type and demands of the target skill, age and ability of the participant? As indicated in the results of this section, the demands of language-based skills may be different than those of motor-based or behavior-based skills which may be more readily modeled, thus contributing to the effects of VSM and video technology in general. New behaviors or those more resistant to change, compared to those behaviors that already exist in a student's repertoire yet requiring remediation or use under other conditions, may also demonstrate different effects with video instruction. Buggey et al. (1999) found that even within the same domain of communication (responding to questions), variability existed based on the type of question being asked, which in turn may have influenced student performance following VSM. Clark et al. (1993) and Possell, Kehl, Mcloughlin, & Bray (1999) further raised questions concerning limiting effects of VSM with young children who may not developmentally demonstrate the cognitive ability to actively attend, retain, and imitate a video model.

Subjective Point of View Video Modeling

A further approach of video technology minimizes the time consuming editing associated with peer or self-models. Video recordings are made from the participant's point of view or eye level (Shipley-Benamou, Lutzker, & Taubman, 2002) as if the person were performing the skill or progressing through an environment such as walking through a store. The video camera moves as if it were the viewer and shows what is supposed to be seen through his/her eyes. This form of video instruction, identified as subjective point of view (Norman, Collins, & Schuster, 2001), was implemented in only two identified studies, each using a VCR. However, a number of studies incorporating this procedure with computer-based programs are presented in a subsequent section of this review.

Subjective point of view was applied as a "priming" method to allow a person to view future events in order to increase the predictability of the events (Schreibman, Whalen, & Stahmer, 2000). Three children, ages 3 to 6 years, with autism participated in the multiple baseline study and watched video scenarios of upcoming events (e.g., going to different stores in the mall, shopping at Wal-Mart) prior to the event, in order to reduce behavior problems associated with transitioning with upcoming events or activities. The use of video-priming resulted in a rapid decrease in disruptive behaviors for 1 student and a gradual decrease for the remaining two students. Results also indicate that behavior reduction was generalized to new transition situations in all but one occasion, supporting the use of video priming as a means to inform students of upcoming events in order to reduce disruptive behaviors.

Shipley-Benamou et al. (2002) used this method of video to teach functional skills such as making orange juice, mailing a letter, and cleaning a fish bowl, to 3 children with autism. Similar to the Schreibman et al. (2000) study, no models were used. Instead, videos were created from the participant's viewing perspective as if the child was watching the skill being completed. During baseline, students were presented with materials and directed to complete the task. The intervention sessions included one viewing of the task being completed on video followed by presentation of the materials. Acquisition greatly improved for the 3 children following video viewing and skills were maintained during a 1-month follow-up. Two of the 3 children completed 100% of the steps correctly across three tasks following intervention, while the third student averaged 94% correct across two tasks.

Overall, results of both studies suggested positive implications for utilizing this relatively new approach for implementing instruction with video technology. Previous studies on priming have relied on verbal instruction to prepare students for upcoming events. Students with autism are often described as strong visual learners which may effect their positive response to video models from a subjective point of view. Of interest will be future studies with students with varying disabilities.

Interactive Video Instruction/Video Prompting

Interactive video instruction is described as video instruction which evokes some form of immediate physical response by the learner (Payne & Antonow, 1982). Programs using video modeling, self-modeling, and video feedback, may only require the learner to passively watch a video recording and later perform a task. Interactive video instruction, also referred to as video prompting, requires the student to watch a portion of a video segment and then make an immediate active response to the video program's prompt (Crusco et al., 1986). Depending on the response of the learner, the videotape is then advanced or repeated by the learner or instructor using a VCR.

Kyhl, Alper, and Sinclair (1999) conducted a study which taught grocery related sight words to 3 students with mental retardation through an interactive video program. Twenty-four aisle sign words were videotaped within the context of the aisle signs with the camera zooming in on the 24 target words. During instruction (using a 5-second delay) students also observed the video and were told to: "Look at the word", "This word is ____", and answer the question, "What is this word"? If a student was unable to identify a word within 5-seconds, the video was paused and the instructor said the word. Words were acquired, generalized to the community, and maintained over a 5-month period. Results support the use of video modeling for the acquisition and generalization of skills to community stores, however it should be noted that instructor feedback and correction were provided along with viewing the videotapes.

A comparison study by Branham el al. (1999) evaluated the effects of a constant time delay procedure using three instructional formats counterbalanced across 3 secondary students with moderate mental retardation. The formats were (a) classroom simulations plus community-based instruction (CBI), (b) videotape modeling (of a peer performing each task analysis in the community) plus CBI, and (c) simulation in the classroom, plus videotape modeling and prompting, plus CBI. Dependent measures were mailing letters, cashing checks, and crossing streets in generalized novel community settings. Effectiveness data, collected in novel community settings, showed no significant difference between the three formats in teaching students. Data showed the simulation plus CBI program to be the most efficient in terms of instructional time while the combination simulation plus videotape modeling and CBI package required fewer instructional sessions. Because CBI was a component of each procedure, effectiveness of individual variables and the efficiency of interactive videotape instruction compared to CBI, which requires time to travel to the community site for instruction, cannot be determined.

Norman et al. (2001) used both video prompting and video modeling to teach self-help skills (e.g., cleaning sunglasses, putting on a wrist watch, and zipping a jacket) to 3 elementary school students with mental retardation. During instruction, students previewed the entire model of the chained steps for completing a skill. Using a constant time delay procedure, video segments of specific steps of the task analysis served as the controlling prompts. Unlike the previous two studies using interactive video instruction, videotapes were created from a subjective point of view (i.e., what the student would see while completing the skill). Data of the multiple probe design, replicated across participants, indicated that the instructional package was effective in teaching self-help skills to the 3 students with fewer sessions required across tasks as students became more familiar with the procedure. Skills were maintained over time and generalized to novel instructors and/or materials.

The interactive component of this procedure adds to the literature which has examined video technology as an observational tool where videotapes provide feedback or models of skills which are performed by the learner at a later date. These studies also present implications for future research into the effects of physical, motor interactions compared to programs which require verbal responses or statements. The final section of this review further evaluates the use of video technology presented through an interactive, computer-based medium.

Computer-Based Video Instruction (CBVI)

Multimedia has been defined as the "nonlinear or non-sequential presentation of text, graphics, animation, voice, music, slides, movies, or motion video in a single system that involves the user as an active participant" (Wissick, 1996, p. 494). Wissick further describes the capability of this technology for "combining several media into one unit that can be used interactively, rather than as a single-medium." p. 496. Computer-based video instruction combines the two technologies of video technology and computer-based instruction with the computer program driving a video player. While early studies (Wissick, Lloyd, & Kinzie, 1992) used videodisc-based programs to create simulations, real-life replications are currently created with video recordings on VHS, 8mm, or digital videotapes and then imported onto a computer or compressed onto CD-ROM. The recordings can then be edited and manipulated by a computer software program such as Hyperstudio 4.0 (Knowledge Adventures, Inc., 2000) or PowerPoint (Microsoft, 2000) to provide interactive learning opportunities.

The interactive videotape programs reviewed to this point have relied on the instructor to control the operation of the VCR and progress the videotapes, dependent upon the participant's response. In addition to being instructor dependent, such programs create difficulties locating specific segments of videotape or repeating a segment as part of an error correction or prompting procedure. A further restriction found with video modeling, feedback, and prompting is the presentation of material in a linear fashion. Computer-based video instruction not only provides an interactive environment for instruction, but also can independently advance programs in response to student performance and immediately branch to different screens (including video segments) in a non-linear format. Through the use of a computer mouse, keyboard, touch screen, or adaptive device, students actively respond to stimuli presented by the computer.

Social stories were presented using CBVI to 3 boys with autism to teach hand washing and on-task behavior (Hagiwara & Myles, 1999). The computer-based program, created with *HyperCard* (Apple Computer, 1994), included audio feedback of sentences in the social story and video segments of the participants' actions corresponding to the story sentences. Using a book-like format, students listened to sentences and viewed video self-models prior to performing the task in the respective environment. Baseline performance, prior to instruction, was high for 2 students with a 73% overlap between baseline and intervention conditions for Student 1 and 100% for Student 2. The third student's on-task behavior, although variable, indicated partial improvement for two settings. Overall, no consistent effect was reported for the multi-media program.

Mechling and Langone (2000) reported positive effects using video captions paired with still photographs to teach photograph recognition, for use with augmentative communication devices, to 2 students with severe intellectual disabilities. Correct selection of the target photograph on the touch screen was followed by a 15-second video segment corresponding to the photograph (e.g., ducks swimming in the water). Students demonstrated an increase in the number of photographs correctly selected by each student using the computer-based program and generalization of the effects to the selection of photographs on their respective augmentative communication devices.

Lancaster, Schumaker, and Deshler (2002) investigated CBVI through the use of a program on CD-ROM. Twenty-two high school students with disabilities participated in a study to evaluate the effects of an interactive hypermedia (IH) program on development of effective communication strategies used during IEP conferences to promote self-determination. The CD-ROM program contained 6 interactive lessons using audio, text, and video clips of peer instructors describing and modeling the strategies. Two additional conditions, teacher lecture with paper-based handouts and a no-treatment control group, were included in the comparison study which used a multiple probe and a pre-post comparison design replicated 3 times across experimental groups. Students substantially increased their responses to questions following both IH and teacher lecture compared to no instruction. Responses during generalization sessions at actual IEP meetings were slightly higher for the IH program. Further, IH combined with a short amount of teacher interaction were effective in teaching self-advocacy strategies.

Two studies applied CBVI alone to teach grocery shopping skills to students with disabilities. Mechling, Gast, and Langone (2002) measured the approach to teach 4 students with moderate intellectual disabilities to read aisle marker signs and locate items in generalized grocery stores. Mechling and Gast (2003) used a similar computer-based program to teach (a) reading of words on aisle signs, (b) reading of words not directly listed on aisle signs, but associated with words on the signs (e.g., parmesan cheese was located on the aisle with the word stuffing), and (c) location of items in grocery stores. Instructional sessions in both studies occurred solely through the computer-based program. In the first study, students increased their performance across 3 stores for entering correct aisles, locating items in the community stores, and generalization to novel stores not videotaped for the instructional programs.

In the second study, text, photographs, and video recordings were used to depict target grocery items and associated words on aisle signs. Text was used to match target words with associated words. Correct selection of the matching word prompted the program to advance to a photograph of the aisle sign, video footage of the two items together, and functional use of the grocery item (e.g., sprinkling parmesan cheese on pasta) from a subjective point of view. Generalization probes conducted in a community grocery store and one novel store indicated that following simulated instruction with the computer-based program, all 3 students were able to match associated words on a grocery list with words on the aisle signs.

Two additional studies evaluated the use of computer-based video instruction to teach purchasing skills (Ayres & Langone, 2002; Mechling, Gast, & Barthold, 2003). Ayres and Langone (2002) used a multimedia approach to teach purchasing using the next-dollar strategy to 3 students with mental retardation. Video footage was made at a local grocery store and models of cashiers from the store directed students to select the correct amount of dollar bills on the computer program. Generalization probes at the grocery store followed CBVI. Interpretation of the results is limited due to time constraints (end of the school year), which prevented completion of the study. The researchers stated that no student was able to master all purchasing value sets, yet the time constraint prevented any student from being evaluated on the final set and 1 participant was evaluated only for one set of purchasing values. For sets receiving instruction, 2 of the 3 students demonstrated acquisition of skills.

Mechling et al. (2003) used both video prompting and video modeling through a computer-based program and constant time delay to teach 3 students with intellectual disabilities the generalized use of a debit card to make purchases in a grocery, discount, and drug store. Students watched a video model of the steps of the task analysis for using a debit card with an automated payment machine (APM) made from the subjective point of view. Unlike previous studies, the computer program delivered all prompts through video recordings. Generalized use of skills using a debit card to make purchases across novel stores was observed in all 3 students.

Overall, results of the studies focusing on CBVI support the effects of these interactive programs. A unique element in a number of studies was the use of CBVI alone as a form of simulation with generalization measures taken in natural environments. For some students, this avenue of instruction may be an effective means to deliver instruction when simulation is required due to limited opportunities for community instruction. Advantages include efficient use of teacher time, cost effectiveness, and numerous opportunities for review and practice over traditional community-based programs.

Discussion

Instructor-created video programs have been used to present concepts in a systematic way, with repetition, in a relatively simple, non-distracting format that focuses the learner on relevant stimuli. This medium was described as being both useful and efficient (Morgan & Salzberg, 1992) with demonstrated advantages of video-based technology including: (a) the provision of realistic representations of the natural environment, (b) immediate feedback, (c) review of difficult materials or steps of a task analysis (Wissick et al., 1999), and (d) programs that can be run independently by students.

Although video technology, in general, may be more effective for children with strong visual processing abilities (Buggey et al., 1999), these investigations reported effects with a range of students, disabilities, and ages. Predictability and controllability were reported as advantageous qualities in teaching children with disabilities. Increased motivation from watching a video with sight, sound, and contextual information (Sherer et al., 2001) as well as watching oneself were all reported as contributors to positive effects.

Studies reported the advantages for some learners of minimizing distractions by requiring students to look at a small area on the computer or television screen. Due to these capabilities, researchers (Charlop-Christy et al., 2000) reported on the effective use of this medium for students with autism. This group of students may selectively attend to particular stimuli, focusing at times on irrelevant features. Video technology may be an effective tool for counteracting the effects of stimulus over-selectivity for these students (Shipley-Benamou et al., 2002) by zooming in closely to relevant cues which may be overlooked by students when learning in the natural environment. In addition, children with autism are frequently stimulated by television and video shows, retelling or echoing phrases heard from each. Teaching skills through video technology may improve motivation by learning through a medium which is already reinforcing for this group of children.

Requirements of learning in the natural environment may create anxiety for some learners, especially those with autism, who may find it stressful to learn in over stimulated settings (Hagiwara & Myles, 1999). In addition to reducing stress from over stimulated settings, video technology may reduce anxiety associated with instruction required from uncomfortable human interactions (Buggey et al., 1999). It has also been reported that video technology may be less intrusive when used in situations where the learner needs desensitization to aversive stimuli (including fearful situations), gradually providing increased information (Houlihan et al., 1995).

Although the creation of video-based instructional materials takes time, so do other teacher-made materials frequently used with students with disabilities. Time consuming editing of self-modeling tapes using only a camera and VCR may become unnecessary as more professional video-editing equipment becomes readily available and affordable. Using this technology requires some practice, such as feedforward and CBVI, however, most programs do not require special modifications of software or hardware. Once produced, video-based materials can be used repeatedly across several students, time, and environments such as home, when intervention is required.

Student access to personal computers has shown improvement since the early 1980s (Hayes & Bybee, 1995) and video technology is becoming increasingly available (Schreibman et al., 2000). Multimedia programs (i.e., Hyperstudio 4.0 and PowerPoint) and technologies such as CD-ROM, which provide large storage capabilities for video, have become widely accessible (Morgan, Gerity, & Ellerd, 2000; Wissick, 1996). Advancements in available equipment such as the ability to create CD-ROMs, compact images, and to make sharper images in less time, contribute to the increased use of this technology. Digital cameras now save photographs and short video clips directly on diskettes while digital video cameras can import video directly to the computer.

Although the overall results of this review suggest that instructor-created video programs are a promising avenue of instruction, some research questions remain unanswered and may require further investigation. For example, is this technology more appropriately used as an adjunct to other instructional methods or can its effects be supported as an independent means for providing instruction? Future research may also need to evaluate the use of video technology in comparison to teaching in natural settings. With increased emphasis on full inclusion for students with disabilities, time spent in community-based instruction may be limited. For students with severe intellectual disabilities, who require instruction in the natural environment in order to generalize skills, teaching through video technology can be less time consuming than traveling to the community and may provide fewer risks of stigmatization of students sometimes found with community-based instruction (Cuvo & Klatt, 1992). While research supports video technology to be an effective means of simulation, care must be taken to provide adequate contextual cues to promote generalization of skills to areas outside the treatment environment (Hepting & Goldstein, 1996).

It appears, based on the results of this review, that both video modeling and video self-modeling can be effective means for delivering instruction. Further research may find answers to the question of whether one is more effective than the other, considering the time required to produce VSM. Not only is time an important consideration for development of programs, but also in their implementation. As noted by Shear and Shapiro (1993), the duration of an intervention can have a possible effect on outcomes. Research which compares brief, intermittent, video technology and continuous, longer periods of instruction may present very different results.

Another area in need of further evaluation may be the influence of student abilities or tasks being taught on the effects of instructor created video programs. Do certain student characteristics such as imitation, attending, observational learning (Clark et al., 1992; Sherer et al., 2001), intellectual ability, and age play important roles in the effects of this technology? Perhaps certain types of behaviors (e.g., low frequency or excessive behaviors) will respond differently to this instructional approach (Clark et al., 1993; Possell et al., 1999).

In addition, what are the effects of using role playing concurrently or sequentially to VSM and VM? Reviewed studies support the use of interactive video and computer-based video programs. An important contribution to the field may include examination of interactive programs compared to those which are strictly observational. Is there a functional role of verbalizations of students while watching videotape in the acquisition and generalization of skills and do the effects differ with the type of task involved? What are the effects of saying/doing or stating rules which will later be performed (Haring, Breen, Weiner, Kennedy, & Bednersh, 1995)?

Future research will likely be challenged with the need to evaluate more advances in video technology such as the use of virtual reality (VR). This technology has been described as a means for immersing the learner in an environment which replicates and responds like the real world where actions of the person control interactions with the three-dimensional world (Strickland, Marcus, Mesibov, & Hogan, 1996). Virtual reality integrates real-time computer graphics, body tracking devices, visual displays, and other sensory input devices to immerse a participant in a computer-generated environment (Rothbaum & Hodges, 1999). The report by Strickland et al. recommends the use of VR as a treatment and intervention tool for students with autism who may require real life learning experiences, while others (Muscott & Gifford, 1994) report on its ability to convince students that they are actually in the simulation, thus enhancing its potential as a teaching tool. Unfortunately, the current cost of the hardware and software for this technology remains unaffordable to most schools, however, a significant decrease in future costs would make this promising medium available to students with disabilities and worthy of future research.

Summary

The purpose of this paper was to investigate existing research on the use of instructor-created video programs to teach individuals with disabilities. A total of 24 investigations were identified from the professional literature that used this type of intervention. Outcomes from the majority of these studies (91.3%) suggested positive effects of instructor-created video programs as tools for instruction. The different procedures (i.e., feedback, modeling, self-modeling, subjective point of view, interactive video, and computer-based video instruction) have been demonstrated as being effective across a range of skills including changing undesirable behaviors and learning new skills such as social, academic, communication, and self-help skills.

Video-based instruction was evaluated across a variety of settings from classrooms to community-based environments.

Studies measuring generalization support this medium of instruction as an effective adjunct to in vivo instruction (Branham et al., 1999) as well as a means to promote generalized skills even without community-based instruction (Mechling & Gast, 2003; Mechling et al., 2003; Schreibman et al., 2000).

This review suggests that instructor-created video programs can be a successful means to increase the acquisition of skills and level of independence of persons with disabilities. Results of this review may be applied by teachers, practitioners, and researchers as a basis for designing instructional strategies for students with disabilities. Future investigations should focus on the continued development and promising potential of this technology.

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