Modeling Skills, Signs and Lettering For Children With Down Syndrome, Autism and Other Severe Developmental Delays By Video Instruction In Classroom Setting

G. B. Biederman & B. Freedman

Abstract

This paper addresses optimal strategies in teaching essential life and communication skills to children with Down syndrome, autism and other developmental delays. Evidence from the literature concerning the relative efficacy of hand-over-hand (self-modeling) in contrast to passive observational teaching techniques (e.g., video modeling) shows the theoretical and empirical basis of the suggestion that passive observation is preferable to other instructional strategies directed to these populations. We describe a classroom program that taught basic life skills, sign language, and printing letters to children with severe delays over a seven-year period using such video instruction.
Keywords: modeling, optimal strategies for teaching, observational learning, Down's syndrome.

Education is a human right providing opportunities for all students to maximize their personal, social and academic development. The present emphasis on accountability has focused the discourse on educational improvement because of the perceived link between the ability to be globally competitive and the quality of schools. The belief by governments and the public that the current levels of student achievement are not good enough has created a sense of urgency. Operating in this environment, educational leaders face competing policy pressures and agendas including demands for accountability for the education of students with special needs. What types of interventions, in special education can enable personal, social and academic development? What are the effective methodologies? School districts are still in a reactive mode coping with issues of accountability, new educational mandates, funding changes and parental demands. Assistive technology helps students with special needs to learn. Passive video modeling described in this paper may address this new direction in special education for achievement, accountability and collaboration with parents.

Typical instructional strategies for children with severe developmental delays often include interactive modeling techniques with instructors delivering physical and verbal guidance and social responses such as "Good job!" or "Good girl!" meant as rewards for appropriate student behavior. This response-contingent prompting (Morgan & Salzberg, 1992; Skinner, Adamson, Woodward, Jackson, Atchison, & Mims, 1993) is often used in combination with interactive modeling where the instructor literally leads the student by the hand so that the student sees him/herself modeling the behavior (Robertson & Biederman, 1989). But other modeling techniques use passive modeling strategies (Ezell & Goldstein, 1991; Shelton, Gast, Wolery & Winterling, 1991; Wolery, Ault, Gast, Doyle & Griffen, 1991). In this modeling technique the student merely observes the model's behavior without directly interacting. The basis of social learning theory is that learning can occur through such passive observation of behavior (Bandura, 1971). A teaching intervention found to be effective is the use of video modeling or the use of taped sequences as exemplar of desired behavior (Delprato, 2001; D'Ateno, Mangiapanello & Taylor, 2003). Video modeling when combined with passive modeling can assist in the acquisition of learning.

Robertson & Biederman (1989) have reported in a meta-analysis of all previously reported research that the relative efficacy of interactive modeling is not statistically supported. As early as 1991, Biederman, Ryder, Davey and Gibson found that passively trained tasks were performed better than those interactively modeled. Passive observation has been recently applied to task learning in laboratory situations for children with severe delays (Biederman, Stepaniuk, Davey, Raven & Ahn, 1999;

Biederman, Fairhall, Raven & Davey, 1998; Biederman, Davey, Ryder & Franchi, 1994; Biederman, Ryder, Davey & Gibson, 1991). In these studies which used a within-subjects design (discussed in detail elsewhere, e.g., Robertson & Biederman, 1989), children were instructed using live models in life skills under two contrasting conditions–active (hand-over-hand) modeling vs. passively observed modeling. In this design there is perfect control of subject-relevant variables such as diagnosis, age, sex, and prior learning, because each child receives both conditions. Any significant differences in training outcomes are attributable to the differences in training conditions. In fact, evidence over a decade of research has consistently indicated that the standard instructional practice of interactive (hand-over-hand) modeling in classroom settings may be counterproductive in teaching fine motor skills to students with little or no active language and with other severe developmental delays (Biederman, 1993).

Further research found additional negative effects from interactive modeling: when response-contingent reinforcement is used in interactive modeling, students with marked developmental delays appear to be unable to make appropriate use of verbal cues intended as reinforcement which typically accompany interactive modeling (Biederman, 1993; Biederman & Davey, 1995). The student may perform some subset of a task to be learned and that behavior may appropriately receive verbal reinforcement, but because of attention problems or delays in processing, the student may misapprehend the contingency underlying this reinforcement, causing disruptions in the learning process (cf. Biederman, Davey, Ryder & Franchi, 1994). Biederman, Fairhall, Raven and Davey, (1997) and subsequently, Biederman, Fairhall, Raven and Davey, (1998a; 1998b) found that passive modeling was significantly more effective than hand-over-hand modeling with response-contingent prompting.

Video modeling is an accessible modification technique that uses videotaped scenarios for students to observe rather than live ones (Keenan & Nikopoulos, 2006; Robertson & Collins, 2003). It allows the student to focus on a consistent repetition without distractions (Keenan & Nikopoulos, 2006). Recent literature suggests that children with severe developmental delays may benefit through instructional techniques which include modeling life skills such as dressing and grooming through slow motion repetitive video presentation. Video modeling conveys realistic behavior with complex stimulus and response routines (Delprato, 2001; D'Ateno, Mangiapanello & Taylor, 2003; Hepting & Goldstein, 1996; Houlihan, Miltenberger, Trench, Larson, Larson, & Vincent, 1995; Keenan & Nikopoulos, 2006). The effectiveness of instructional videos in teaching basic life skills to children with developmental delays is consistent with results from classroom instruction with children without developmental delays (McNeil & Nelson, 1991). The participants in this study were able to abstract the necessary skills from the videotaped model and apply them to task performance. Despite the generally positive results from instructional strategies with video presentations, modeling factors that may optimize the effectiveness of such instruction have not been systematically addressed. Basic parameters that are candidates for such examination are presentation speed, number of repetitions of the modeled behavior, and duration of videotaped presentation segments.

In fact, few experiments have attempted to isolate the effects of presentation speed in live modeling conditions. In one study, varying the rate of verbal passage readings to a faster or slower speed than students' usual reading rate produced no improvements in reading (Shapiro & McCurdy, 1989; Skinner et al., 1993). Other studies claim improved accuracy of reading is directly related to an increased presentation speed (Freeman & McLaughlin, 1984; Smith, 1979). Biederman, Stepaniuk, Davey, Raven and Ahn (1999) reported the first evidence in the literature that children with severe developmental delays (Down syndrome or autism as the primary diagnosis) can benefit by *slowing* the presentation speed of video-modeled instruction. This effect is consistent with the literature cited above (see also, Merrill & Mar, 1987). Biederman, Stepaniuk, Davey, Raven and Ahn (1999) reported the first evidence in the literature that children with severe developmental delays (Down syndrome or autism as the primary diagnosis) can benefit by *slowing* the presentation speed of video-modeled instruction. Success has also been reported in modifying the social skills of adolescents with developmental delays (Kelly, Wildman &

Berler, 1980). Even if it were the case that laboratory evidence showed that video modeling was no more effective than live modeling, video modeling would arguably be preferable to live modeling because video presentations are a less labor-intensive instructional tool. Video modeling has a clear advantage for experimentation in that it standardizes instruction. In Biederman et al. (1999) children observed a video model performing two basic dressing skills without prompting, verbal or otherwise, or explanation by an instructor. In the two-task within-subjects design dressing skills that were presented at a relatively slow presentation speed through video modeling were performed better on test than those presented at a relatively fast speed (Biederman, et al., 1999). The present paper describes classroom program in a large school district (70,000 students) using the laboratory techniques described above. In this board about 7,000 children are in special education classes. In terms of diagnoses about 8-10% of children are diagnosed with Down syndrome, 50% with learning disabilities, and about 10% as part of the autism spectrum disorder.

Over a seven-year period video presentation of grooming and dressing skills has been systematically introduced to a large number of self-contained classrooms for children with developmental delays. The method uses small group viewing of models performing tasks at 50% normal speed in repetitive 10-minute segments. Children watched for 14 sessions without attempting the tasks and then were offered the tasks. In 24 classrooms children with appropriate viewing skills and with adequate manipulatory abilities mastered skills that they had never previously performed.

Life Skills:

In the initial stage of this program four skills were videotaped modeled by a female teacher. The selection included zipping, buttoning, snapping, and bow-tying. In the case of the first three tasks, the model wore a vest with buttons, snaps, or a zipper. In the bow-tying video, the teacher's hands are seen tying a bow on a model shoe. The video material was modeled at 50% of normal speed and each task was completed in approximately 30 seconds. Children were selected on the basis of not having had the four tasks in their repertoire and with sufficient vision to view the video and fine-motor manipulation (judged by their teacher) to perform these tasks. The reason that the vests or model shoe were not presented during two-week observation period was to discourage imitation. Robertson and Biederman (1989) have noted that imitation is viewed as the weakest form of observational learning and runs the risk of inhibiting generalization of the target task limiting the skill to the materials supplied within the classroom. In the present program, teachers were instructed not to interact with the children during the observational period or during the child's performance of the task itself. The rationale for this lack of interaction has been discussed above and in Biederman (1993). In each classroom each child in this pilot study was judged by his or her teacher to have adequately performed each of the four tasks (there were 36 children in this initial project). We asked teachers to determine whether these newly learned tasks were retained by the student and generalized to performance not associated with the materials supplied. The teachers reported clear generalization in many students and good retention (at least, over the course of the school term) but we could not track each student in this study. Although anecdotal, teachers report that these tasks are retained and generalized about as well as any new learning in their students. In subsequent years, additional classes received these tasks and addition life skills were added as required by teachers (see Table 1). In addition four specialized tasks were successfully instructed through similar video modeling in an occupational workshop setting (see Table 1). The skills tasks listed in Table 1 were transferred to DVD format to facilitate ease of presentation in the classroom. A menu is provided on the DVD for teacher use. The life skills DVDs are currently in classroom use in the Durham board. Successful implementation of these skills and similar skills are clearly dependent and the motivation of teachers to use this material and frequent in-service teacher education of this program that clearly has counterintuitive elements to usual teacher expectations.

***TABLE 1*. INSTRUCTIONAL MATERIAL AVAILABLE VIA VIDEO MODELING**

I. LIFE SKILLS VIA DVD

Dressing, Grooming and Life Style Skills:

Snapping, zippering, tying a bow, lacing, putting on socks, cloth wringing, pouring water, setting a table, face washing, hand washing, nail brushing, teeth cleaning, flipping on jacket, putting on backpack, locking locker.

Dressing, Grooming and Life Style Skills:

Snapping, zippering, tying a bow, lacing, putting on socks, cloth wringing, pouring water, setting a table, face washing, hand washing, nail brushing, teeth cleaning, flipping on jacket, putting on backpack, locking locker.

II. SIGNS VIA DVD

Layout of Sign Language DVD

(Model 1–Jenelle senior, non-hearing, student, Model 2–Wendy sign language instructor adult)

Category 1: Feelings

Feelings1 – Jenelle – tired / sick / happy / angry / sad
Feelings2 – Wendy – disappointed / frightened / excited / safe

Category 2: Social

Social1 – Jenelle – hi / goodbye / please / thank-you / sorry
Social2 – Jenelle - more / stop / yes / no / toilet / home
Social 3 – Jenelle – shoes / coat / mitts / hat / help / school

Category 3: Describing

Describing1 – Wendy – hot / cold / wet / smooth / rough
Describing 2 – Wendy – bumpy / hard / soft / sticky
Describing 3 – Jenelle – in / out / up / down / on / off

Category 4: Transportation

Transportation1 – Wendy – bus / car / bike / motorcycle / truck
Transportation2 – Wendy – boat / taxi / airplane / helicopter

Category 5: Appliances

Appliances – Wendy – refrigerator / washing-machine / dryer / radio / telephone

Category 6: Liesure

Leisure1 – Jenelle – book / ball / computer / tv / music
Leisure 2 – Jenelle – bowling / swimming / shopping / cooking / walking

Category 7: Meal

Meal 1 – Jenelle – eat / drink / cookies / finished / water
Meal 2 – Wendy – meat / milk / juice / apple / banana / crackers
Meal 3 – Wendy – hotdog / pizza / pop / chips / ice-cream / cake

Category 8: Actions

Actions1 – Jenelle – come / go / look / listen / wait
Actions2 – Jenelle – want / sleep / stand / sit / play
Actions3 – Wendy – walk / run / fall / throw / kick
Actions 4 – Wendy – hit / stir / hug / spill / catch

Category 9: Animals

Animals (pets) – Wendy – hamster / cat / fish / bird
Animals (zoo) – Wendy – lion / tiger / elephant / monkey / giraffe
Animals (farm) – Wendy – cow / pig / horse / chicken

III. UPPER AND LOWERCASE ALPHABET PRINTING VIA VIDEOTAPE

IV. OCCUPATIONAL SKILLS AVAILABLE VIA VIDEOTAPE

Assembling product tags, packing electrical components, assembling button components.

Signs:

Following success with the life skills videos, a sign language video instruction program was attempted with a somewhat different instructional basis. In this program imitation is encouraged and the

active involvement of the instructor is required because learning signs must be embedded in a larger language-learning context. Several signs are presented in series in a video presentation according to the menu selections shown in Table 1 (e.g., feelings: "tired," "sick," "happy," "angry," "sad."). Each sign is presented in the following sequence: a picture symbol of the word to be signed is given with an audio presentation of the word. A model is then shown signing (ASL) the word, and the word is heard on audio. Two 50% normal speed presentations of the signs are then presented followed by a final normal speed presentation of the sign with audio. The next sign in the series is then presented in the same way, and the series of signs is presented for 30 min. each day for a 14-observational period. The children are encouraged to "copy" the sign, and the instructor incorporates the experience into the language program s(he) may prefer. Candidates to receive this instruction require the similar vision and manipulation requirements as in skills instruction, but inclusion is a teacher decision and is informed by the child's current language skills. Teachers report high degrees of success with this program which has been available for about two years. The teacher reports are similar to the accounts received in the skills program.

Lettering:

Printing lower case and upper case letters were also presented via video in a pilot study with a presentation format similar to the signing format. That is a picture of the letter appears with an audio of the letter. A teacher's hand then prints the letter with audio followed by two 50% speed printings without audio and a final normal speed presentation with audio. Preliminary results from six classes were very positive. As in signing, imitative behavior was not discouraged and the teacher freely interacts with the students during observation and performance. In the printing video, teachers select a single upper or lower case letter for instruction and this is repeated for the 30-min. period. In lettering as well as signing the presentation method uses small groups (4-6 students) viewing the video presentations.

The present classroom experience with video instruction is particularly relevant to the increasing demands for demonstrable achievement by all students. Modeling via video allows students freer access to research-based instruction and enables parents to become more informed and supportive partners in their child's school experience. In the case of life-skill learning, a few families were given the video material and reported great success in teaching skills to their children with special needs, and in fact, in one case, the parent reported that her (pre-school) child with no delays also benefited from viewing the skills videos. We anticipate that the utility of providing parents with signing videos will be similarly beneficial to both students and parents.

Present-day educational theory does not favor passive instruction. Most educators associate passive learning with teacher-centered learning where teachers direct and active learning with teachers as guides (Mezeske, 2004). However, there a range of possibilities offered by passive learning and clearly video modeling is among them. Googling video modeling resulted in 55,900,000 citations. Video recording becomes an instructional tool where modeled actions provide an exact version of a desired outcome shown to students in order to develop appropriate behaviors. It allows students to memorize, imitate and generalize those behaviors (Neumann, 2000). Because videos are small and portable it can be used at home to strengthen parent/school connections. It has the potential to increase the learning by reinforcing school instruction by home instruction. Nikopoulos & Keenan (2004) reported that for all children, social interaction and reciprocal play skills were enhanced, and these effects were maintained at 1- and 3-month follow-up periods (93). Video modeling instruments such as Special Kids(C) Video Modeling Therapy Programs are used in 30 countries. Video modeling has been clinically shown to increase and sustain learned actions (Charlop-Christy, Le & Freeman, (2001); LeBlanc, Coates, Daneshvar, Charlop-Christy, Morris & Lancaster, 2003; Nikopoulos & Keenan, 2004, 2006). Video modeling is currently being considered as an effective intervention for children in the autism spectrum (Nikopoulos & Keenan, 2004, 2006; Robertson & Collins, 2003). We suggest that he program we

describe in this paper adds weight to the growing evidence that the position of passive instruction for some student populations and in some circumstances needs to be thoroughly reconsidered.

Special education has evolved in response to changing needs and expectations of what learning means for students with special needs. Once students with special needs were segregated, peripheral to school systems, but currently this is no longer true. Today inclusion/integration is the placement of first choice. Students with special needs spend at least 50% of their day in regular classrooms with regular teachers. "It is imperative that inclusion means not only the practice of placing students with special needs in regular classroom but ensuring that teachers assist every student to prepare for the highest degree of independence possible (Ontario Ministry of Education, 2005a, p. 2). Most classrooms have identified students with a range of exceptionalities and learning needs. To ensure that all students achieve, interventions that target specific challenges are required to scaffold their learning. Sometimes these require direct teaching and modeling by teachers, and sometimes other methodologies are required.

School districts are still in a reactive mode coping with issues of accountability, new educational mandates, funding changes and parental demands. Assistive technology helps students with special needs to learn. Passive video modeling may address this new direction in special education for achievement, accountability and collaboration with parents.

References

Bandura, A. (1971). *Social learning theory.* New York: General Learning Press.

Biederman, G. B. (1993). The negative effects of positive reinforcement. *Journal of Autism and Developmental Disorders*, 23, 411-412

Biederman, G. B. & Davey, V. A. (1995). Practice versus process: Rigidity of reinforcement requirements results in regressive research. *Exceptional Children*, 61, 493-496.

Biederman, G. B., Davey, V. A., Ryder, C., & Franchi, D. (1994) The negative effects of positive reinforcement in teaching children with developmental delay. *Exceptional Children*, 60, 458-465.

Biederman, G. B., Fairhall, J. L., Raven, K. A. & Davey, V. A. (1997). Interactive modeling vs. passive observation in teaching basic skills to children with Down syndrome and developmental delays: The role of benchmark and social reinforcers. Invited paper presented to 6th World Congress on Down's Syndrome, Madrid, October.

Biederman, G. B., Fairhall, J. L., Raven, K. A. & Davey, V. A. (1998a). Verbal prompting, hand-over-hand instruction, and passive observation in teaching children with developmental disabilities. *Exceptional Children*, 64, 503-511.

Biederman, G. B., Fairhall, J. L., Raven, K. A. & Davey, V. A. (1998b). Teaching basic skills to children with Down Syndrome and developmental delays: The relative efficacy of interactive modeling with social rewards for benchmark achievements and passive observation. *Down Syndrome: Research and Practice*, 5, 26-33.

Biederman, G. B., Ryder, C., Davey, V. A., & Gibson, A. (1991). Remediation strategies for developmentally delayed children: Passive vs. active modeling interventions. *Canadian Journal of Behavioural Science*, 23,174-182.

Biederman, G. B., Stepaniuk, S., Davey, V. A., Raven, K. & Ahn, D. (1999).

Observational learning in children with Down syndrome and developmental delays: The effect of presentation speed in videotaped modeling. *Down Syndrome: Research and Practice*, 6, 12-18.

Charlop-Christy, M., Le, I. & Freeman, K. (2001). A comparison of video modeling with in-vivo modeling for teaching children with autism. *Journal of Autism and Developmental Disorders*, 30, 537-552.

D'Ateno, P., Mangiapanello, K., & Taylor, B. (2003) Using video modeling to teach complex play sequences to preschoolers with autism, *Journal of Positive Behaviour Interventions* 5, 5-11.

Delprato, D. (2001). Comparisons of discrete-trial and normalized behavioral language intervention for young children with autism, Journal of Autism and Developmental Disorders, 31 (3), 315-325.

Ezell, H. K. & Goldstein, H. (1991). Observational learning of comprehension monitoring skills in children who exhibit mental retardation. *Journal of Speech and Hearing Research*, 34, 141-154.

Freeman, T & McLaughlin, F. F. (1984). Effects of taped-word treatment procedure on learning disabled students' sight word oral reading. *Learning Disability Quarterly*, 7, 49-53.

Hepting, N., & Goldstein, H. (1996). Requesting by preschoolers with developmental disabilities: videotaped self-modeling and learning of new linguistic structures. *Topics in Early Childhood Special Education*, 16, 407-427.

Houlihan, D., Miltenberger, R. G., Trench, B., Larson, M., Larson, S. & Vincent, J. (1995). A videotape peer/self modeling program to increase community involvement. *Child & Family Behavior Therapy*, 17, 1-11.

Kelly, J. A., Wildman, B. G., & Berler, E. S. (1980). Small group behavioral training to improve interview skills repertoire of mildly retarded adolescents. *Journal of Applied Behavior Analysis*, 13, 461-471.

LeBlanc, L., Coates, A., Daneshvar, S., Charlop-Christy, M., Morris, C. & Lancaster, B. (2003). Using video modeling and reinforcement to teach perspective-taking skills to children with autism. *Journal of Applied Behaviour Analysis*, 36, 253-257.

McNeil, B. J. & Nelson, K. R. (1991). Meta-analysis of interactive video instruction: A 10-year review of achievement effects. *Journal of Computer-Based Instruction*, 18, 1-6.

Merrill, E. C., & Mar, H. H. (1987). Differences between mentally retarded and non-retarded persons' efficiency of auditory sentence processing. *American Journal of Mental Deficiency*, 91, 406-414.

Mezeske, B. (2004). Shifting paradigms? Don forget to tell your students. http://www1.umn.edu/ohr/teachlearn/tp/index.html.

Morgan, R. L. & Salzberg (1992). Effects of video-assisted training on employment-related social skills of adults with severe mental retardation. *Journal of Applied Behavior Analysis*, 25, 365-385.

Nikopoulos, K. & Keenan, M. (2004). Effects of video modeling on social initiations by children with autism. *Journal of Applied Behavior Analysis*, 37, 93-96.

Nikopoulos, K. & Keenan, M. (2006). *Video modelling and behaviour analysis: A guide for teaching social skills to children with autism.* Jessica Kingsley Publishers.

Robertson, H. A., & Biederman, G. B. (1989). Modeling, imitation and observational learning in remediation experimentation 1979-1988: An analysis of the validity of research designs and outcomes. *Canadian Journal of Behavioural Science*, 21, 174-197.

Roberston, M. & Collins, A. (2003). The video role model as an enterprise teaching aid. *Education and Training*. 45 (6), 331-340.

Shapiro, E. S. & McCurdy, B. L. (1989). Effects of a taped-words treatment on reading proficiency. *Exceptional Children*, 55, 321-325.

Shelton, B., Gast, D.L., Wolery, M., & Winterling, V (1991). The role of small group instruction in facilitating observational and incidental learning. *Language, Speech, and Hearing Services in School*, 22, 123-133.

Skinner, C. H., Adamson, K. L., Woodward, J. R., Jackson, Jr., R. R., Atchison, L. A., & Mims, J. W. (1993). A comparison of fast-rate, slow-rate, and silent previewing interventions on reading performance. *Journal of Learning Disabilities*, 26, 674-681.

Smith, D. D. (1979). The improvement of children's oral reading through the use of teacher modeling. *Journal of Learning Disabilities*, 12, 172-175.

Wolery, M., Ault, M. J., Gast, D. L., Doyle, P. M., & Griffen, A. K. (1990). Comparison of constant time delay and the system of least prompts in teaching chained tasks. *Education and Training in Mental Retardation*, September, 243-247

Author Contact Information

G. B. Biederman, Professor Emeritus
Tel: (416) 985-6470
g.biederman@rogers.com