DOCUMENT RESUME

ED 240 795 EC 161 868

AUTHOR	Wehman, Paul; And Others
TITLE	Vocational Curriculum for Multihandicapped Students with Cerebral Palsy: A Lata-Based Approach.
SPONS AGENCY	Department of Education, Washington, DC.
PUB DATE	Nov 83
CONTRACT	82-37-300-82-0357
NOTE	27p.; Paper presented at the Annual Conference of the Association for the Severely Handicapped (10th, San Francisco, CA, November 3-5, 1983).
PUB TYPE	Speeches/Conference Papers (150) -- Reports - Descriptive (141)
EDRS PRICE	MF01/PC02 Plus Postage.
DESCRIPTORS	Adolescents; Case Studies; *Cerebral Palsy; Clerical Occupations; Computers; Curriculum; *Employment; *Job Skills; Job Training; Microreproduction; *Multiple Disabilities; Office Occupations; Task Analysis; *Teaching Methods; *Vocational Education; Young Adults

ABSTRACT

The paper describes a data-based vocational curriculum for multiple handicapped adolescents and young adults with cerebral palsy. Three care studies illustrate the different types of curricula that may lead to employment in the areas of micrographics filming, computer skill, and clerical work. The approach incorporates a task analysis orientation with modeling, social reinforcement, and frequent feedback. Objectives and skill sequences were drawn from observation of identical jobs in companies in the community. In each setting, attention was paid to modifying or adapting tasks where necessary to help improve vocational performance. Participants in each of the areas displayed competence after training. (CL)

Vocational Curriculum for Multihandicapped Students with Cerebral Palsy: A Data-Based Approach

Paul Wehman   Wendy Pietruski   Mark Hill

Roberta Goodwyn   Fred Orelove   Stephen Conley

Virginia Commonwealth University
and
Richmond Cerebral Palsy Center

Descriptors: Multihandicapped, cerebral palsy, youth, vocational training, technology, job analysis, adaptations

Running Head: Vocational Curriculum

The development and dissemination of this paper was partially supported by contract #82-37-300-82-0357 from the Special Needs Section, U.S. Dept. of Education. We wish to thank Michael Ward our project officer and Paul Thompson, Section Chief for their support of our work. In addition, a special thanks goes to the Richmond Cerebral Palsy Center Executive Board for the development of vocational technology training area at the school, and Mr. Charles Clough and Mrs. Mary Alice Penn two key employers who helped us in program design.

Paper Presented

at

The Association for the Severely Handicapped

Annual Conference

10th

San Francisco, California

November 1983

Abstract

The purpose of this paper is to highlight vocational instruction of multi-handicapped adolescents who exhibit cerebral palsy. Specifically, vocational training occurred in three curriculum areas: computer usage, use of a printer/calculator, and micrographic filming. Each of these vocational areas was drawn from community job analysis and with the help of selected local employers. Direct skill instruction and limited rehabilitation engineering were introduced to help adapt the tasks. All students who participated displayed skill competence after training.

Vocational Curriculum for Multihandicapped Students With Cerebral Palsy: A Data-Based Approach

The research literature related to improving sheltered employment (Bates, Renzaglia, & Clees, 1980; Bellamy, Peterson & Close, 1976; Gold, 1972; Irvin & Bellamy, 1977; Renzaglia, Wehman, Schutz, & Karan, 1978) and competitive employment (Hill & Wehman, 1983; Rusch, 1979; Wehman, 1981; Wehman, Hill, Goodall, Cleveland, Brooke, & Pentecost, 1982) for persons labeled moderately, severely, or profoundly mentally retarded reveals substantially more vocational potential than was thought as recently as 10-12 years ago. Yet these studies have concentrated almost exclusively on the ambulatory mentally retarded population. A review of the special education and rehabilitation literature indicates that those individuals with severe physical handicaps such as cerebral palsy have received relatively little attention in vocational training and placement.

It is noteworthy, however, that a small number of experimental efforts have been underway in selected Independent Living Centers (Leslie, Note 1) and Rehabilitation Research and Training Centers (Mallik, 1979). For example, Mallik (Mallik & Shaver, 1981) has devoted a significant amount of attention to this area by applying rehabilitation engineering techniques to physically impaired clients. Rehabilitation engineering involves the systematic implementation, modification, and redesign of a job using engineering technology. (See Mallik & Yuspeh, 1979 for discussion of this technology.)

A greater concentration on vocational programming of multihandicapped individuals with cerebral palsy is needed for several reasons. First, the national unemployment rate of individuals with cerebral palsy continues at an appallingly high rate of 50-70%. This rate was also reflected in our own pilot study sample of graduates of the local program for students with cerebral palsy, which showed 11 out of 16 or 69% recent graduates to be unemployed (Goodwyn, Pietruski, Wahlquist, Wehman, & Conley, Note 2). Second, with the difficulty involved in independent living and community integration experienced by many individuals with cerebral palsy, a job is crucial to being a part of the mainstream of society. Significant problems in mobility and communication affect community integration, and a job in a nonsheltered setting is frequently the only form of interaction with people available in the community. In addition, difficulties in motor coordination and functioning can also greatly limit the range of jobs available. Finally, the cost of maintaining individuals with cerebral palsy in predominantly non-work oriented day programs is tremendous, due both to the costs of continued Social Security Disability Income and the costs of these types of adult day programs (Bellamy, Sheehan, Horner, & Boles, 1980; Hill & Wehman, 1983). Multihandicapped students with cerebral palsy who are not trained with marketable vocational skills and placed into jobs with appropriate follow-up support services will become unemployed adults and become susceptible to these problems.

This paper describes three strands of a vocational curriculum that we believe have merit in vocational program design for some multihandicapped individuals with cerebral palsy. Although it is always necessary to provide a systematic analysis of each local community for appropriate jobs (Mithaug, Hagmeier, & Haring, 1977), we believe that the areas of micrographics filming, computer skills, and clerical work may hold opportunities for jobs in many areas throughout the country. This belief is supported by data from a report by the U.S. Commission on Civil Rights (1983) as well as Fortune magazine (Fortune, 1983). Thus, this article outlines a sample curriculum in each service area and provides data on the learning rates of many of the students that participated in the program. Each data-based program was evaluated in a multiple baseline across students design. With this design, training and intervention procedures are staggered across students so as to demonstrate a functional relationship between training techniques and rate of acquisition (Hersen & Barlow, 1978).

Program I: Micrographics Filming

Participants, Setting and Equipment

Two students, Jack and Bill, participated in the initial prugram. Each student had cerebral palsy with moderate spastic quadriplegia. Jack, age 18, had arrested hydrocephalus which had required numerous hospitalizations for shunt revisions. He was confined to a wheelchair which he propelled with one hand. Although he had some control of his right hand, he essentially used only his left in all tasks. He was legally blind, with a correction of 20/200 with glasses. Psychological testing placed his functioning in the low educable mentally retarded range. Perceptual motor skills were at the five year level. He was described as socially immature, overly dependent and demanding of adult attention, and reluctant to assume responsibility. Bill, age 15, used a wheelchair, but could also creep on the floor to transfer. His tight hip extensors caused him to sit with less than 90° of his hip flexion. He could use both hands, but hypertrophy of shoulder muscles and lack of trunk mobility limited extreme range of shoulder motion. In verbal skills he tested in the educable mentally retarded range, although in performance skills he tested in the trainable range.

The task, micrographics filming, was taught on a Recordak RV-2 planetary camera. This camera is designed so that documents are placed one at a time, face up, on a flat filming plane under the camera lens. Documents as large as 11 inches by 15 inches can be filmed using this camera. Thousands of different types of medical, insurance, government, etc. reports may be filmed for reduction in size. For this study, document sizes were 8-1/2 inches by 11 inches or or smaller. Documents were mixed with single and double-sided copy. Figure 1 provides an illustration of the equipment. The studies took place in a special program for school age students with cerebral palsy.

Insert Figure 1 about here

Rationale for Skill Selection

Micrographics filming was selected as a vocational skill to be trained for several reasons. First, it was identified as a job that did not depend on the ability to move around the work environment. Second, the motor actions required could be performed by an individual possessing the use of one or both hands. Third, handicapped individuals have been successfully employed in micrographics filming jobs (Mallik & Kung Foo, 1976). Finally, the task consisted of simple repetitive motions that could be easily learned by an individual with mild to moderate retardation.

Task Analysis

The task analysis was written based on observation of the job in a local business setting. For this study the documents filmed were unbound pages with a mixture of single and double-sided copy. The initial assessment and training was based on the following task analysis:

Micrographic Filming Using a Planetary Camera

1. Sit facing camera and work materials.
2. Turn camera on by pushing black switch toward back of camera.
3. Wait for lights on both sides of camera to come on.
4. Pick up first document to be filmed.
5. Place document horizontally, face-up on the filming plane of the camera.
6. If print is vertically aligned on the paper, turn top of page to the left.
7. If print is horizontally aligned on paper, turn top of page towards back of camera.
8. Straighten document within markers on filming plane.
9. Press black button to take picture.
10. Lift document from filming plane.
11. Check back of document for print.
12. If print on back of document, repeat steps 5 through 10.
13. Place document face down in box for completed work.
14. Continue until all documents are filmed.
15. When filming is complete, turn camera off by pulling black switch towards front of camera.

Teaching Procedures

Following an initial baseline period, training began on micrographics filming. During the baseline period, Jack was observed to miss steps seven and eight and steps eleven through 5. Billy was also missing the steps involving positioning the document and checking the back for print.

Jack was trained first; plastic cornering brackets were placed at the corners of the filming plane to assist with placement and positioning of the documents. This was especially helpful given Jack's visual impairment as well as his having use of only one hand to perform this task. For steps eleven through 15, verbal cueing and repeated practice were used to teach Jack to check the back of each document. He did have enough residual vision to detect print on the backs of documents.

Training with Billy started when Jack's performance had reached approximately 90 percent accuracy. The same plastic cornering devices were used to help Billy with positioning. Verbal prompting was also used to train steps

11 through 15. Both students were given social reinforcement for performing the task correctly. Jack also responded very well to daily feedback on his progress.

Behavior Observation and Reliability

Non-reinforced, non-prompted probes were taken daily on each student using the task anslyais. The percentage of accuracy was calculated based on the number of steps performed correctly.

Interrater reliability data were collected by having a part-time assistant record probe data with another trainer. Interrater reliability averaged 90% for this study.

Results

Examination of baseline data indicated that both participants were able to complete the micrographics filming task with less than 50 percent accuracy.

Insert Figure 2 about here

After training and adaptations to the equipment, both students were able to perform the task with over 90 percent accuracy. In fact, Jack had performed the task for four consecutive days with 100% accuracy by the 15th session and was ready to move into the production phase of training for this task.

Program II: Use of Printer/Calculator

Participants, Setting and Equipment

The students were adolescents with spastic cerebral palsy and related perceptual-motor difficulties. Rick, age 15, had moderate spastic diplegia and ambulated independently but with precarious balance. He had functional hand usage. Psychological testing placed him in the educable mentally retarded range. Tracey and Carla both exhibited spastic quadriplegia and were confined to wheelchairs, which they propelled manually. Tracey, age 18, has scoliosis surgery (spinal fusion) with resultant decreases in trunk mobility. She had spasticity in both upper extremities, and primarily used only one hand. Her test scores were in the low educable mentally retarded range with perceptual-motor performance at the five year level. Carla, age 19, had a history of low motivation. She could transfer out of her chair and could creep independently. She had functional, although limited, use of both hands. Test scores indicated a learning level in the upper educable mentally retarded range with perceptual-motor skills at the eleven year level.

The task, using a printer calculator, was taught on a Texas Instruments (TI) 5040 II calculator with a printer. The TI printer/calculators are relatively inexpensive. The 5040 II model contains all of the standard operation keys necessary for business use as well as memory capability for storage and recall of numerical entries.

Rationale for Skill Selection

Using a printer/calculator was selected as a vocational skill to be taught primarily because it was frequently listed by members of the business community as a valuable skill for clerical office workers to have. Many jobs were observed, particularly in banks, where use of a 10-key number pad was important. The application of number pads skills also was not restricted to operating calculators or for numerical computation. Many jobs were observed using computers, microfilm readers, and automated filing equipment, where the 10-key number pad was used to assist in the storage and retrieval of numerical data, e.g., electronic zip sorting, accounts research in banks, and directory assistance in telephone company.

Task Analysis

The calculator task in this study was designed to acquaint the students with the basic operation of the printer/calculator in the context of customer account balancing. The task analysis used in the initial program was as follows:

Use of a Printer/Calculator

1. Sit facing calculator and work materials.
2. Turn calculator ON by switch on side of machine.
3. Locate decimal control switch and line dot on sliding switch up with "+".
4. Press the "C" key to clear machine.
5. Enter first item in column from work sheet without entering decimal point.
6. Verify entry by checking lighted display. Press (+) or (-) as indicated on worksheet.
7. Enter second item in column from worksheet without entering decimal point.
8. Verify entry by checking lighted display. Press (+) or (-) as indicated.
9. Continue for each item to be entered.
10. Use 00 key appropriately.
11. If key is pressed incorrectly, but without entering operator key, correction is made by pressing CE key.
12. If key is pressed incorrectly, and operator key is also pressed, press (+) or (-) to negate the number entered incorrectly, then re-enter item correctly.
13. If necessary, use C key to clear machine and restart item entry for a column.
14. After entering all items, press "T".
15. Record total in appropriate place on worksheet.
16. At completion of worksheet, turn calculator OFF by switch on side of machine.
17. Cover calculator with dust cover.

Teaching Procedures and Observation

After a period of baseline data collection, training was started on the calculator task. All three students began training on steps two and three in the task analysis as these steps were not being performed by the students during the baseline period.

Verbal prompting and modeling were used most often by the trainers to instruct the students. Small visual cues were placed on the calculator, e.g. a red self-adhesive dot by the decimal control switch, to assist students with frequently skipped steps. Also, simple written instructions on cue cards were provided for students to use the appropriate error correction procedure for any given situation. Students performing the target steps correctly were socially reinforced by the trainer. When steps were performed incorrectly, the students would receive verbal instructions with modeling, if necessary, along with repeated practice of the incorrect step or steps.

Behavior Observation and Reliability

For each training session, one non-reinforced probe was taken, usually at the beginning of the work period. The trainer would give the general instruction to the student to "compute the ending balance" and then would record the student's performance without prompting or reinforcing. Responses were scored as plus (+) for correct performance and minus (-) for incorrect. Percentage of the task completed correctly was computed by dividing the number of correct responses by the total number of steps in the task analysis, and then multiplying by 100.

Interrater reliability was collected by having the two trainers collect probe data simultaneously. Reliability was calculated by dividing the number of agreements by the total number of agreements plus disagreements and then multiplying by 100. Interrater reliability averaged 92 percent for this study.

Results

Data shown in Figure 3 indicated all three students were performing

Insert Figure 3 about here

between 20 and 60 percent of the task correctly during the baseline period. After systematic instruction was provided, Tracey was able to complete the task with 80 percent accuracy by session 9 and was performing above 90 percent by session 23. Rick's performance increased from 30 percent during baseline to 100 percent after six sessions of training. Carla reached 100 percent accuracy very soon after training was initiated, i.e., by the fourth training session. When a student performed the task with 95 percent accuracy or above, he/she was moved into the production phase of training where speed and accuracy were the training focuses.

Program III: Use of Microcomputer

Participants, Setting and Equipment

Carla, as reported in the previous section, was a 19 year old with spastic quadriplegia with functional hand usage and confined to a wheelchair. Neil, age 20, acquired brain damage at age 13 from injuries received in an auto accident. He was diagnosed as having left spastic hemiplegia and had recently learned to ambulate using one crutch. He primarily had use of only one hand. Typical of those with acquired brain damage, his speech and movements were slow and he had difficulty remembering. He tested in the borderline range of learning ability. He demonstrated persistence in tasks and seemed to have a social awereness of the value of work. John was a 14 year old with spastic hemiplegia following meningitis as an infant. He had no use of his left hand but could use his upper arm to assist in holding objects. He ambulated independently. He was suspected of having petit mal seizures but his EEG was normal. His learning ability rested at the educable mentally retarded range. Hia perceptual-motor ability was at the five year level.

This task was trained using an Apple IIe or a Franklin Ace 1000 microcomputer. Equipment included the computer, monitor, and two disk drives for each microcomputer.

Rationale for Skill Selection

Computer keyboard based joba are expanding at an incredible rate. A new set of business, private, and recreation spplications seems to appear daily. The major reason for computer growth is the computer's information handling capabilitiea: fast, accurate, and programmable. A new field in computers is emerging; designers are finding the computer an extremely helpful aid for handicapped individuals. It may eventually have an impact similar to the wheelchair.

Applications that have enhanced the way handicapped individuals perform include: speech synthesizers for those who cannot speak, transparent keyboard emulators which require one awitch, and speed enhancing coding systema.

In addition to the computer as an aid, many jobs exist in the computer field thet a wide variety of handicapped individuals can do. Computer related positions entail a wide range of physical requirements, from the computer operator who must exhibit many physical skills to the programmer who needs cognitive rather than physical skills. During a community assessment of technology jobs, positions were identified that did not require extensive data processing or programming expertise. In fact, numerous clerical, accounting, editing, and data retrieval tasks were found which were relatively simple and repetitive. It was felt that many of these tasks could be taught to severely physically involved individuals and, with proper job development strategies, many could enter the competitive job market.

Task Analysis

The computer task in this study was designed to teach the students to use the computer to run any standard software contained on floppy disks. Also, part of the task included a signing-on or logging-on procedure which was frequently observed in business computer operations in the community.

The task analysis is as follows:

Computer Operation/Sign-on Procedure

1. Turn computer on by switch on multi-outlet.
2. Press CONTROL and RESET keys simultaneously.
3. Locate desired disk in disk file (disk with sign-on program).
4. Remove disk from protective pocket.
5. Hold disk by label - label facing up.
6. Hold disk with oval cut-out towards disk drive.
7. Do not bend disk.
8. Slide disk into disk drive.
9. Input PR #6
10. Press RETURN key.
11. Input CATALOG
12. Press RETURN key.
13. Input RUN SIGN ON
    (program name)
14. Press RETURN key.
15. Input operator code _ _ _ _ _.
16. Press RETURN key.
17. Input date _ _/_ _/_ _.
18. Press RETURN key.
19. Input time __/__.
20. Press RETURN key.
21. Open disk drive door.
22. Remove disk from drive.
23. Replace disk in pocket.
24. Return disk to disk file.

25. Input NEW to erase computer main memory.
26. Press RETURN key.
27. Input HOME to clear video screen.
28. Turn computer off (or run another program by repeating steps 3 through 14 and steps 21 through 28.)

Teaching Procedure and Observation

Baseline data indicated that Neil should begin training on the set of steps, nine through 13. Carla and John were to begin their instruction on steps 16 through 21. Modeling and verbal prompting along with repeated practice were used to teach this task. Repeated practice in this study was defined as practicing the task one to three times daily, at least three days each week. Modeling was gradually faded out and certain verbal prompts were replaced by short written cue cards.

Students were socially reinforced by staff for performing steps correctly. In addition, the immediate feedback from the computer also served to reinforce students proceeding correctly through the task.

Daily data were collected on each participant during a non-prompted, non-reinforced probe. Reliability data were collected in the same manner as in the previous two programs and averaged 92 percent.

Results

Baseline data for all three participants indicated limited ability to operate the computer, with Neil averaging 35 percent, Carla 50 percent and John 29 percent. After training procedures were initiated, Neil was able

Insert Figure 4 about here

to complete the routine with 95 percent accuracy or above by the seventeenth session. Carla achieved mastery of the task almost immediately after instruction was started. As Carla achieved 100 percent accuracy, training was initiated with John, who performed above 95 percent after only six training sessions.

General Discussion

The preceding case studies were presented in order to highlight the different types of vocational curriculum that may facilitate employment for multihandicapped students with cerebral palsy. Although we do not suggest that these are particularly dramatic demonstrations of competence, there are several noteworthy points which need to be made about each program. First, vocational objectives and skill sequences were drawn directly from the behavioral observation and recording of identical jobs in several companies in the area. Hence, community job analysis and screening were the basis for our curriculum.

Second, we took a data-based direct skill instructional approach to teaching unlike many vocational programs for higher intellectual functioning handicapped youth. Vocational programs for the cerebral palsied population have frequently been characterized by filmstrips, workbooks, and other didactic career education experiences about work as opposed to specific development of marketable skills.

A third approach used in these programs was the modification or adaptation of a task where necessary to help improve vocational performance. We have much more to learn in applying vocational adaptations; however, our initial experiences have confirmed our sense of the critical nature of "engineering" jobs and work stations, especially for students with this type of disability.

Finally, in each of the preceding programs we evaluated our teaching techniques and adaptations in a multiple baseline across students design. This design allowed us to verify that increases in work competence were directly attributable to the instructional interventions provided.

Multihandicapped students with cerebral palsy present a unique challenge to those who design vocational education programs. Most of these students have some type of serious communication deficit, at times inappropriate social behaviors, and invariably, significantly impaired gross motor functioning. On the other hand, most of the students were intellectually only mildly or borderline mentally retarded and some were in the normal ranges of intelligence. Obviously many of the entry level, manual labor competitive employment positions (e.g., custodial and sheltered workshop bench work positions) are simply outside of the physical abilities of these students. Furthermore, more advanced white collar work is also unlikely for the mildly retarded cerebral palsied individual. Hence, it is necessary to carefully analyze as many different "white collar" types of positions which may fill entry level gaps in the newly emerging high technology area. Clearly, micrographics and computer technology are the growth areas in which there are selected niches for multihandicapped individuals.

In our future writing on this topic we anticipate a) focusing in more depth on specific vocational standards and b) reporting on the community placement work experiences and employment prospects of multihandicapped youth with cerebral palsy. it is necessary to apply behavioral technology with job engineering for these students and in community settings as much as possible. Without this preparation, the likelihood of employment is greatly decreased.

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Figure Captions

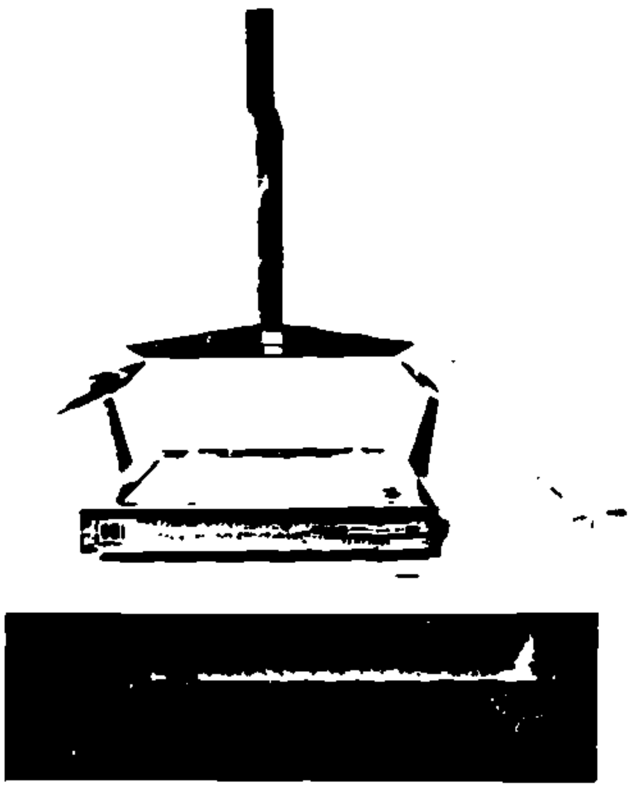
Figure 1. Illustration of Recordak RV-2 Planetary Camera

Figure 2. Acquisition Phase Micrographics Filming

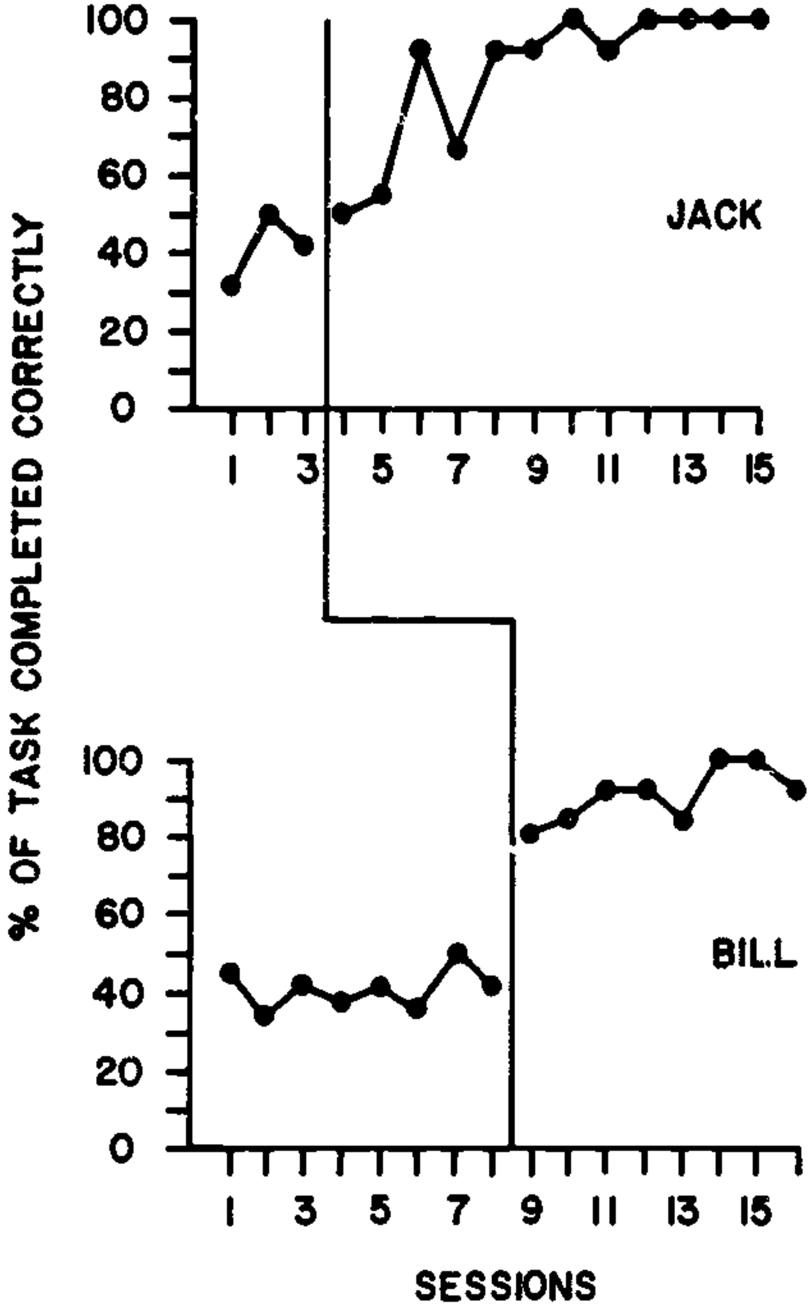
Figure 3. Calculator Skills

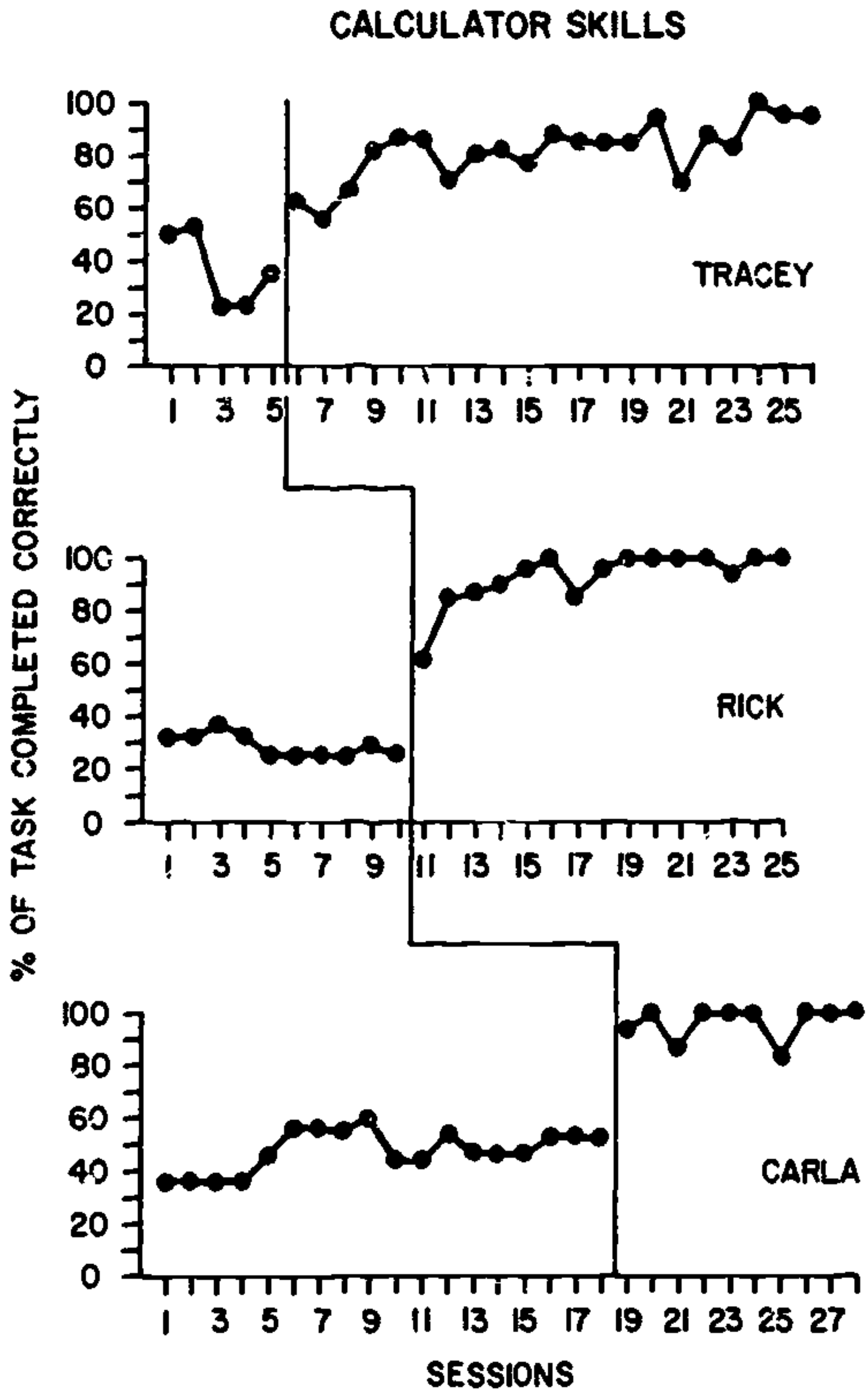
Figure 4. Computer Usage

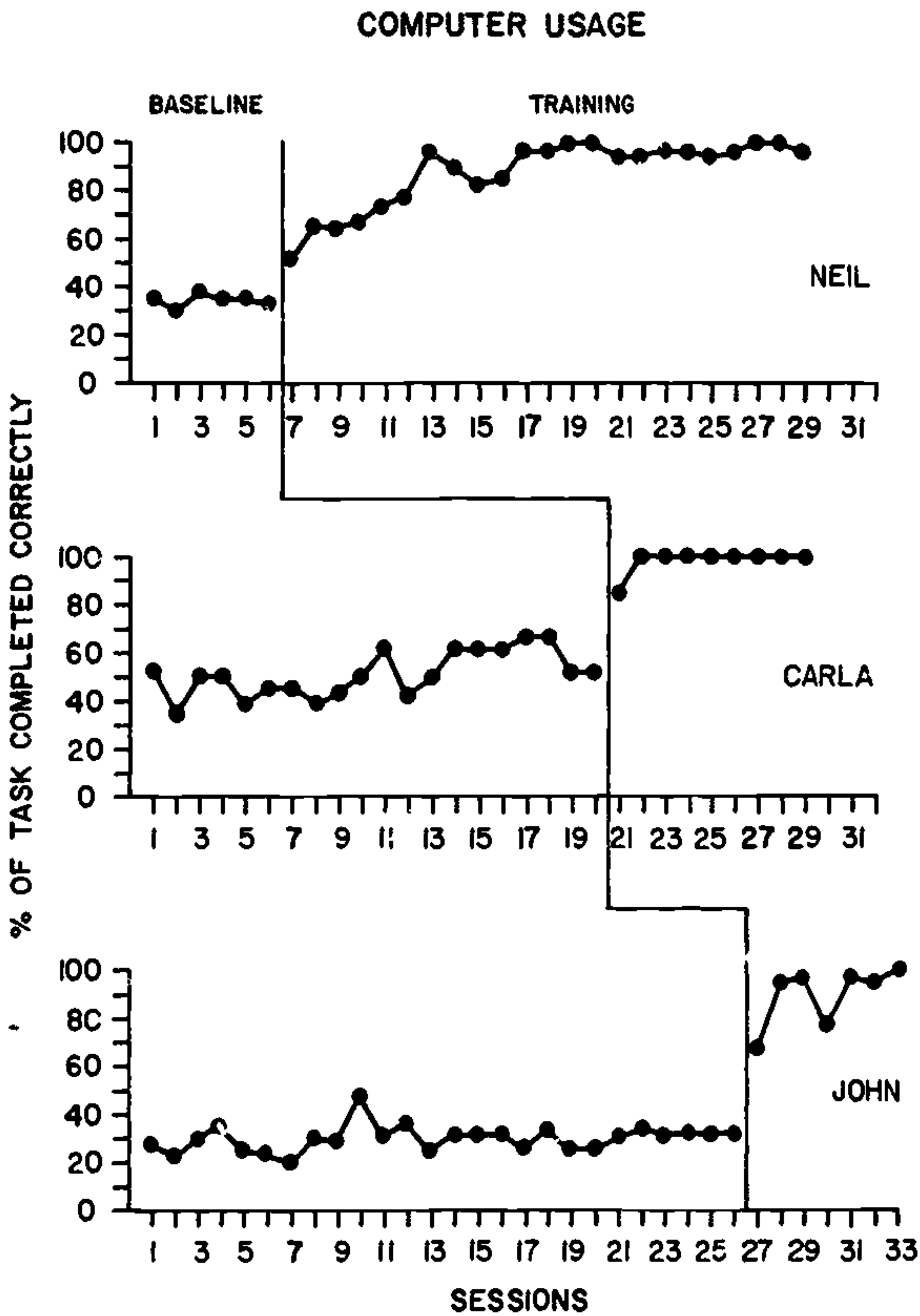
Illustration of Recordak RV-2 Planetary Camera



ACQUISITION PHASE
MICROGRAPHICS FILMING




CALCULATOR SKILLS
% OF TASK COMPLETED CORRECTLY
100
80
60
40
20
0
TRACEY
1 3 5 7 9 11 13 15 17 19 21 23 25
RICK
CARLA
1 3 5 7 9 11 13 15 17 19 21 23 25 27
SESSIONS


COMPUTER USAGE
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NEIL
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JOHN
% OF TASK COMPLETED CORRECTLY
SESSIONS