DOCUMENT RESUME

ED 100 099		EC 070 876
AUTHOR	Brown, Lou, Ed.; And Others	
TITLE	The Development and Implementation of a Public School Prevocational Training Program for Trainable Retarded and Severely Emotionally Disturbed Children. Progress Report. Part 1.	
INSTITUTION	Madison Public Schools, Wis. Dept. of Specialized Educational Services.	
SPONS AGENCY	Wisconsin Alumni Research Foundation, Madison Wisconsin State Dept. of Public Instruction, [illegible]son. Bureau for Handicapped Children.	
PUB DATE	Aug 71	
NOTE	354p.; For related yearly program reports see EC 070 877-879	
EDRS PRICE	MF-$0.75 HC-$17.40 PLUS POSTAGE	
DESCRIPTORS	Academic Ability; Behavioral Objectives; *Daily Living Skills; *Emotionally Disturbed; Exceptional Child Education; Language Instruction; Mathematics; Mentally Handicapped; *Prevocational Education; Reading; Task Analysis; *Teaching Guides; *Trainable Mentally Handicapped	

ABSTRACT

Reported are instructional programs generated in the first year (1970-71) of a Madison, Wisconsin public school project to develop a prevocational training program for trainable retarded and severely emotionally disturbed students. Programs are based on a behavioristic task analysis teaching model and are designed to teach functional vocational, home living, and academic skills. The section on vocational skills contains guidelines (including behavioral objectives, instructions to use with students, and student evaluation forms) for teaching 10 work tasks (such as catalog collating, labeling and addressing, and wire sorting). Five studies on the development of prevocational behaviors include titles such as 'Increasing Individual and Assembly Line Production Rates of Retarded Students.' Provided in the section on home living skills are step-by-step guidelines for teaching cooking (including vocabulary lists and approximately 40 simplified recipes); housekeeping skills (such as dish washing); and laundry skills. The section on academic skills consists of 12 papers on teaching reading, arithmetic, and language and includes such titles as 'Teaching a Trainable Level Student Basic Sight Vocabulary.' Briefly discussed are future plans to develop areas such as leisure skills, social behavior, and community orientation. (LS)

The Development and Implementation of a Public School Prevocational Training Program for Trainable Retarded and Severely Emotionally Disturbed Children

Progress Report
Part I

Madison Public Schools

Department of Specialized Educational Services

Bill K. Tilley, PH.D., Director

August, 1971

Editors:

Lou Brown, PH.D.

Tom Bellamy, M.A.

Ed Sontag, ED.D.

THE DEVELOPMENT AND IMPLEMENTATION OF A PUBLIC SCHOOL PREVOCATIONAL TRAINING PROGRAM FOR TRAINABLE RETARDED AND SEVERELY EMOTIONALLY DISTURBED CHILDREN[1]

Progress Report[2]

Madison Public Schools
Madison, Wisconsin

August, 1971

Prepared By:

Lou Brown, Ph.D.
Tom Bellamy, M.A.
Ed Sontag, Ed.D.

2 In addition to funds from the people of Madison, this project was supported with funds from the State of Wisconsin Department of Public Instruction, Bureau of Vocational Education and Bureau of Education of Handicapped Children; and the Madison District Office of Vocational Rehabilitation. Funds from the Wisconsin Alumni Research Foundation supported part of the writing of this report.

This report is the result of the collective efforts and resources of many dedicated and considerate persons in Madison and the State of Wisconsin. Dr. Douglas Ritchie and Dr. Jean McGrew, provided unusual administrative tolerance and support from the Madison Public School Central Administration.

In addition to funds from the people of Madison, financial assistance was obtained from Mr. Rod VanDeventer of the Madison district office of the Wisconsin Department of Vocational Rehabilitation; the Wisconsin Department of Public Instruction, Bureau for Handicapped Children and Bureau of Vocational Education and the Wisconsin Alumni Research Foundation.

Sincere appreciation is expressed to the following employees of the Madison Public Schools: Mrs. Irene Stevens, Supervising Teacher, Badger School; Mrs. Betty Troccolo, Mrs. Hope Bastian, Mrs. Eva Gadberry, Mrs. Lucille Perlmutter, Mrs. Patricia VanDeventer, Mrs. Barbara Huppler, Mr. Sylvester Johnson and Miss Judith Bancroft.

Appreciation is expressed to the students of the Department of Studies in Behavioral Disabilities at the University of Wisconsin who gave much of their time and energy to the project.

Finally, deep gratitude is expressed to the students and parents of Badger School who offer to all those involved the challenge to understand, to learn, to enjoy and to hope.

L.J.B.
G.T.B.
E.W.S.

The Development and Implementation of a Public School Prevocational Training Program for Trainable Retarded and Severely Disturbed Students

Outline

I. Introduction

A. Organization

B. Basic teaching model

II. Development of functional vocational skills

A. Purpose of prevocational training program

1. Assumptions

2. Model

B. Badger school prevocational training program

1. List and description of tasks taught

C. Examples of behavioristic task analysis

1. Sample analyses of ten tasks

2. Summary data sheet of tasks to which each student was exposed

3. Sample record of number of tasks to which an individual student was exposed

D. Development of specific prevocational behaviors in specific students

1. Increasing individual and assembly line production rates of retarded students

2. Increasing the production rates of trainable retarded students in a public school simulated workshop

3. Effects of consequences on production rates of trainable retarded and severely emotionally disturbed students in a public school workshop

4. The development of quality, quantity, and durability in the work

performance of retarded students in a public school prevocational workshop

5. Use of group contingent music to increase the assembly line production rates of retarded students in a simulated workshop

III. Development of functional home living skills

A. Purpose of functional home living skills

B. Development of functional home living skills

1. Cooking

a. Teaching students to identify kitchen utensils and food objects.

b. Teaching students to read recipe directions.

c. Teaching students to read recipe directions and perform specified behaviors in sequence.

(1) Breakfast

(2) Lunch

(3) Dinner

2. Housekeeping

a. Teaching students to identify housekeeping objects.

b. Teaching students housekeeping skills using verbal directions.

(1) Dishwashing

(2) Floor Vacuuming

(3) Dusting

c. Teaching students housekeeping skills using a stimulus fading procedure.

(1) Method for teaching table setting

d. Teaching students housekeeping skills using a sequence of performance criteria

(1) Bed changing program

(2) Bed making program

3. Laundry

a. Washing clothes

b. Drying clothes

c. Folding clothes

d. Ironing clothes

IV. Development of functional academic skills

A. Introduction

B. Reading papers

1. Teaching a "trainable level" student basic sight vocabulary.

2. Individual and group instruction with trainable level retarded students.

3. Trainable level retarded students teach trainable level retarded students.

4. Teaching functional reading to trainable level retarded students.

5. Teaching functional reading to young trainable students: Toward longitudinal objectives.

6. Development of selected pre-reading skills in young trainable students.

C. Arithmetic papers

1. A procedure for the development and measurement of rudimentary quantitative concepts in low-functioning trainable students.

2. Teaching addition to young trainable students: A sequential procedure.

3. A sequential procedure for teaching addition skills to trainable retarded students.

4. Use of a stimulus-fading procedure to teach retarded-emotionally disturbed students to discriminate mathematical operations.

D. Language papers

1. Teaching trainable level retarded children to speak in sentences.

2. A procedure for teaching trainable students to follow verbal directions.

V. Development of leisure skills

VI. Development of appropriate social skills

VII. Demands of the future

A. Technology

B. Instructional Content

C. Community Orientation

D. Vocational Training

VIII. List of papers included in the report

INTRODUCTION

Historically, public school programs for trainable retarded and severely emotionally disturbed students have not distinguished themselves as unqualified successes. Many, if not most, of the students who have passed through these programs have been committed to residential institutions, or remained at home as long term dependents of parents and accepting relatives. Rarely have such students become self supporting and contributing members of our society.

There are at least two recent trends becoming manifest that will undoubtedly place a substantial amount of economic, philosophic and instructional pressure upon public school programs.

First, residential institutions are exhorbitantly expensive, shamefully over crowded and notoriously inefficient at providing their residents with an environment that allows for even close approximations of maximum personal functioning. Many demonstrations have suggested that it is considerably less expensive to provide services that maintain a person in a community than to provide maintenance in an institution. It is also quite apparent that residential institutions are at or above physical capacity and that massive amounts of funds will have to be expended before a substantial number of persons can be absorbed. Thus, the expense of maintaining and establishing residential facilities, the current satiation of existing facilities, plus the poor record of programmatic success of almost all of these facilities have convinced many persons that alternate forms of training and care have to be found.

Second, it is generally becoming accepted in our country that all children, no matter what their handicapping conditions, have a right to public school training. Thus, the issue is not whether trainable retarded and severely emotionally disturbed should be excluded from public school programs but how the public schools can best prepare these students to function effectively in their respective post-school environments. In other words, these students will be in our public schools; now, what do we do with them.

In the summer of 1970, the Madison District of Vocational Rehabilitation provided funds so that persons from the Madison Public Schools and the University of Wisconsin could plan and organize a public school prevocational training workshop. These funds gave those concerned with the Badger School program the opportunity to expend time and energy, not available during the school year, to arrive at program objectives and plans for their realization.

The ultimate purpose of the Badger School program is to teach each student enrolled in the program to become a socially, personally and economically self-sufficient individual in a community setting. An incidental, but nevertheless crucial secondary purpose is to develop instructional content, instructional procedures, and instructional materials that can be used as vehicles to approximate the ultimate purpose.

Organization

The entire Grant report will be divided into the following five different components.

A) Development of Functional Vocational Skills

B) Development of Functional Home Living Skills

C) Development of Functional Academic Skills

D) Development of Leisure Skills

E) Development of Appropriate Social Skills

It should be obvious that the components are arbitrarily delineated for organizational purposes. In no way is it suggested one set of skills can be developed to the exclusion of the others. Indeed, it is our considered opinion that the components delineated above are only a small sample of those necessary for effective community survival and that each set of skills is probably inevitably confounded with many others. Nevertheless, since we are just starting to delineate and teach essential skills, we have chosen to classify on the basis of function.

Basic Teaching Model

The teaching model employed throughout can best be conceptualized as behavioristic task analysis. Task analysis refers to the reduction of new learning to the smallest functional component parts. Behavioristic task analysis demands the additional requirement that each component of a task be an observable response.

In our view this kind of model is particularly suited to the instructional needs of TMR and SED students in that it has been our experience that we cannot assure that students are acquiring information incidentally or by observation. The only way we can be reasonably assured that these students are learning is to see them perform the required responses. In addition, the behavioristic task analysis model places the responsibility of instruction on the teacher rather than the students. That is, if a student cannot demonstrate competence on a particular task it is the teacher's responsibility to divide the task into more manageable units, to teach the response requirements of the new units, and then to progress to new and more complex responses.

The following are requirements that we feel are tentative basic essentials of behavioristic task analysis:

First, the teacher must specify terminal objectives in behavioristic terms. That is, she must convert the required criterion performance into observable responses.

Second, the teacher must analyze the criterion responses and divide them into a series of less complex responses.

Third, the teacher must arrange the responses she decides are necessary for completion of the terminal response into a series.

Fourth, the teacher must teach or verify the existence of the student's ability to perform each response in the series.

Fifth, the teacher must teach the students to perform each response in the series in serial order.

Sixth, in an attempt to delineate successes and failures, the teacher must record student performance during each teaching phase so that adjustments can be made during the teaching process.

Hopefully, each of the above six requirements will be met in each instructional task. However, they may not occur in serial order, or two or more steps may occur simultaneously.

Part II

DEVELOPMENT OF FUNCTIONAL VOCATIONAL SKILLS

Purpose of prevocational training program

This component of the report will be concerned with factors that are related to the development of functional vocational skills.

The ultimate purpose of the vocational component of the prevocational training program at Badger School is to provide each trainable level retarded and severely emotionally disturbed student with a vocational repertoire sufficient to obtain and maintain remunerative employment in a community industrial setting. In the past too many, if not most of these students, upon completion of public school programs, have been placed in expensive and developmentally questionable state institutions, sheltered employment settings requiring subsidies from the state, or have been kept at home. Only a small proportion have been engaged in remunerative employment.

Assumptions. There are at least three crucial assumptions upon which the vocational component is based.

First, it is assumed that trainable and severely emotionally disturbed students will be physically, intellectually and socially capable of being employed in a community remunerative work setting.

Second, it is assumed that the public school in cooperation with other public service agencies and parents, ultimately (after 15 years of public school programming) will be able to develop and implement vocational training programs that will provide the students with marketable vocational repertoires.

Third, it is assumed that in the near future more diverse community vocational settings will be available to these students so that institutionalization, competitive employment, sheltered workshops and a life time at home are not the only vocational alternatives.

Model (Specification of terminal objectives in behavioristic terms). There are probably thousands of behaviors that must be in a student's behavioral repertoire in order for him to function efficiently in a vocational setting. A crucial question then is, "What are these behaviors?" In an attempt to answer this question the public school staff visited several sheltered workshops and selected private industries in an attempt to delineate the specific job tasks which the students would be expected to perform upon completion of their public school careers. Samples of the many work tasks observed were then either brought to the Badger School workshop in toto or adapted for use in a public school setting. There were several tasks that could not be brought to the school because the necessary equipment was too expensive, too space demanding or required staff that is currently unavailable.

The following is a tentative list of job tasks selected and adapted for use at Badger School.

Badger school prevocational training program

List and description of tasks taught.

1. Collating - task: Collate 4 page catalogs using a collating rack and place completed catalogs in a cross-hatched pile.
2. Sorting sandpaper - task: Sort 4 grades of sandpaper ranging from extra coarse to fine from one pile into 4 boxes.
3. Wire sorting - task: Sort mixture of steel and copper wire into 2 separate piles.
4. Packaging and packing library cards - task: Package cards into packs of 50; count the finished packs and pack them into a box.
5. Spoon bagging - task: Place a plastic spoon into a plastic bag.
6. Heat sealing bagged spoons - task: Seal bagged spoons in a heat sealer.
7. Packaging drapery hooks -

   Task A: Fill a loading device with 14 drapery hooks.

Task B: Place a label on package and insert package into jig with stapler to staple right side of package.

Task C: Insert package into jig with stapler to staple left side of package.

Task D: Place package into jig with one hole punch and punch out hole and place finished package into box.

8. Sorting labels and coupons - task: Sort boxes of labels and coupons into marked paper bag. At least 100 different labels and coupons are sorted by recognizing label stapled to bag.

9. Sorting Birdseye labels - task: Sort at least 57 different kinds of Birdseye labels by recognizing label stapled to bag.

10. Pleater hooks assembly - task: Assemble a two piece metal and plastic pleater hook with the use of a jig.

11. Resealing potato chip bags - task: Use plastic cement to close faulty end of potato chip bags.

12. Stuffing envelopes - task: Stuff windowed envelopes with an insert and return envelope so that the receiver's name and address shows through correctly.

13. Bolt discrimination - task: Sort 8 different kinds of bolts along color, size and form dimensions.

14. Collating and assembling a newsletter - task: Collate and staple a ten to twelve page newsletter.

15. Fabric discrimination - task: Match different fabrics according to texture, color and pattern.

<u>Examples of behavioristic task analysis</u>

Behavioristic task analysis procedures were utilized in an attempt to adapt the following work samples for instructional purposes.

1) Catalog collating

2) Sandpaper sorting

3) Wire sorting

4) Labeling and addressing

5) Packaging and packing library cards

6) Inspecting, counting and boxing library files

7) Packaging fish bait

8) Colored paper collating

9) Heat sealing plastic bags

10) Assembling drapery hooks

The following are examples of how many of the tasks listed above were analyzed. The subsequent series of papers contain a description of each task, how the task was broken into components, the specific terminal behaviors of concern, the materials and arrangements utilized, the measurement procedures employed, etc.

These papers are examples of how specific tasks might be taught to specific students. Obviously, it is necessary to adapt each task and each teaching procedure to each individual student. It should be noted that under ideal conditions each student would be trained to perform to capacity on each of the tasks. However, conditions were not ideal. Due to space, time, and staff demands, all students who spent time in the workshops received exposure to many of the tasks; no student was exposed to all tasks. In addition, only a relatively few students were able to receive individual and intensive training on particular tasks.

Although it was virtually impossible to give each student even exposure to every available work task, attempts were made to approximate this ideal. The following is a data sheet that attempts to communicate the specific tasks with which each student had contact. In addition, a data sheet that attempts to communicate a record of how many tasks an individual student received exposure to is also included. If a student was exposed to a particular task an (X) was placed in the block to the right of the description of the task. If a student was not exposed to a particular task the space at the right of the description of that task was left blank. Thus, a record of how many tasks to which each student was exposed could be maintained.

Exposure, as it is used here, simply means that the student was taught to perform the task successfully. However, as will be discussed in detail in the following section, being able to perform a task successfully is only one of the many criteria for successful vocational adjustment.

Work Sample #1 - Collating Catalogs

Purpose: Measure the student's behavior with regard to:

1) motor skills,
2) ability to follow directions,
3) ability to imitate,
4) attention span,
5) accuracy,
6) neatness, and
7) production rate.

Task: Collate four-page catalogs using a collating rack and place completed catalogs in a cross-hatched pile during a 10 minute period.

Materials and Equipment:

A) 1 collator rack with wells numbered 1-10 from bottom to top.
B) 100 catalog covers
C) 100 page one
D) 100 page two
E) 100 page three
F) timer

Instructions to Students: Point to the sheets of paper in the collating rack and give the following verbal instructions:

"Your job is to collate these sheets of paper into a catalog and put the catalogs in a pile on the table."

The evaluator models the behavior while saying:

1) With one hand take one sheet of paper from well number one.

2) Place the sheet of paper flat on the palm of your other hand.

3) Take one sheet of paper from well number two.

4) Place this sheet on top of the paper you're holding in your other hand.

5) Take one sheet of paper from well number three.

6) Place this sheet on top of the papers you're holding in your other hand.

7) Take one sheet of paper from well number four.

8) Place this sheet on top of the papers you're holding in your other hand.

9) Straighten the papers you're holding to make them neat. All four corners should be even.

10) Place this pile of papers on the table. This pile of papers makes one catalog.

11) Make another catalog the same way you made the first one.

12) Put this second catalog crosswise on top of the first catalog. This stacking crosswise is called cross-hatching.

13) Put your third catalog crosswise on top of the one below it.

14) Remember, when you finish a catalog place it crosswise on top of the one below it.

15) When I say GO, you start making the catalogs. When I say STOP, we will count the number you did.

Data Sheet: The data sheet indicates raw score measurements of the student's performance in each session.

Comments: A blank page is included in each booklet for the evaluator to make specific comments about the behaviors and performance of each student.

Production Graph: Production in the collating task should be 100 completed catalogs in a ten-minute period. Industry allows a 10% "personal time" loss which sets the industrial norm at 90 completed catalogs in ten minutes.

A client in work adjustment in a sheltered workshop must produce 70% of the industrial norm in order to exhibit acceptable behavior.

Daycare norms are at least 10% of the normal production.

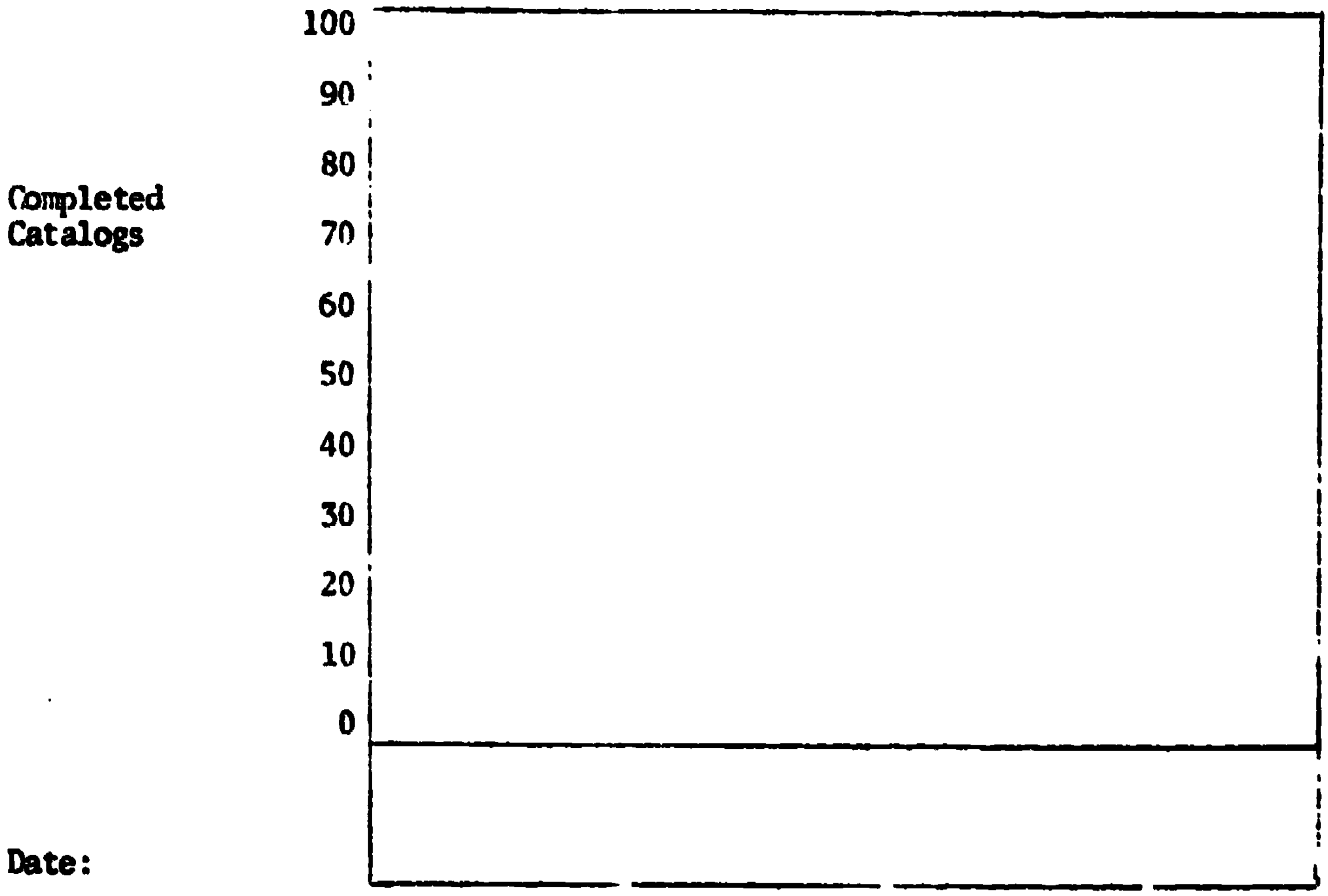
Student

Evaluator

Work Sample #1 - Collating Following Verbal Instructions and Matching a Model	Trial 1 # /10	Trial 1 T-W /10	Trial 2 # /10	Trial 2 T-W /10	Trial 3 # /10	Trial 3 T-W /10	Trial 4 # /10	Trial 4 T-W /10
1) Takes one sheet of paper from well #1.	Y	N	Y	N	Y	N	Y	N
2) Places sheet of paper on palm of hand.	Y	N	Y	N	Y	N	Y	N
3) Takes one sheet of paper from well #2.	Y	N	Y	N	Y	N	Y	N
4) Places 2nd sheet of paper on top of first in palm of hand.	Y	N	Y	N	Y	N	Y	N
5) Takes one sheet of paper from well #3.	Y	N	Y	N	Y	N	Y	N
6) Places 3rd sheet of paper on top of others in palm of hand.	Y	N	Y	N	Y	N	Y	N
7) Takes one sheet of paper from well #4.	Y	N	Y	N	Y	N	Y	N
8) Places 4th sheet of paper on top of others in palm of hand.	Y	N	Y	N	Y	N	Y	N
9) Straightens papers to make them neat. Corners match.	Y	N	Y	N	Y	N	Y	N
10) Places pile of papers on table.	Y	N	Y	N	Y	N	Y	N
11) Piles other catalogs in cross-hatch fashion.	Y	N	Y	N	Y	N	Y	N

Motor Components								
1) Pulls sheets from collator wells one at a time.	Y	N	Y	N	Y	N	Y	N
2) Uses both hands for collating.	Y	N	Y	N	Y	N	Y	N
3) Places sheets without dropping on top of one another.	Y	N	Y	N	Y	N	Y	N
4) Can make wrist and arm movements to place catalogs crosswise in pile.	Y	N	Y	N	Y	N	Y	N

WORK SAMPLE #1 - Collating
Production Graph



90 Industrial Norm
63 Sheltered Workshop
10 Daycare

Red (accuracy rate, Total-wrong)

Blue (production rate - total produced)

Green (number of errors)

Work Sample #2 - Sorting Sandpaper

Purpose: Measure student's behavior with regard to:

1) ability to discriminate texture,
2) accuracy,
3) attention span,
4) production, and
5) ability to follow instructions.

Task: Sort four grades of sandpaper ranging from extra coarse to fine from one box into four boxes during a 10 minute period.

Materials:

A) 320 5 1/2" x 4 1/2" pieces of sandpaper - extra coarse.
B) 320 5 1/2" x 4 1/2" pieces of sandpaper - coarse
C) 320 5 1/2" x 4 1/2" pieces of sandpaper - medium
D) 320 5 1/2" x 4 1/2" pieces of sandpaper - fine
E) 1 large box type container
F) 4 boxes marked very rough, coarse, smooth, and fine (Corresponding sample of sandpaper should be fastened to box and used as sorting cues.)

Instructions to Students: Evaluator indicates large box of sandpaper and the four smaller marked boxes.

"Your job is to sort the sandpaper in this box into four separate boxes."

1) (Give the student a piece of extra coarse sandpaper to touch.) "Feel how rough this piece of sandpaper is."

2) (Take back the piece of sandpaper and put it in the box marked "extra coarse".) "This extra coarse sandpaper should be sorted into this box."

3) (Give student a piece of coarse sandpaper.) "Feel this piece of sandpaper. It feels rough but not as rough as the first piece. We call this coarse."

4) (Take back the sandpaper and put it in the box marked "coarse".) "This coarse sandpaper should be sorted into a separate box."

5) (Give student a piece of medium sandpaper.) "Feel how much smoother this piece of sandpaper is than the first two pieces."

6) (Take back the piece of sandpaper and put it in the box marked "smooth".) "This smooth sandpaper should be sorted into a separate box."

7) (Give student a piece of fine sandpaper.) "This fine sandpaper is smoother than all the others."

8) (Take back the piece of sandpaper and put it in the box marked "fine".) "This sandpaper should be sorted into a separate box."

9) "The sandpaper in this big box is all mixed up together."

10) "Your job is to take pieces of sandpaper from the mixed-up box and separate them so that all one kind is together."

11) (Demonstrate with a piece of each kind of sandpaper.) "The very rough sandpaper goes in this box, the coarse sandpaper goes in this box, the smooth sandpaper goes in this box, and the fine sandpaper goes in this box."

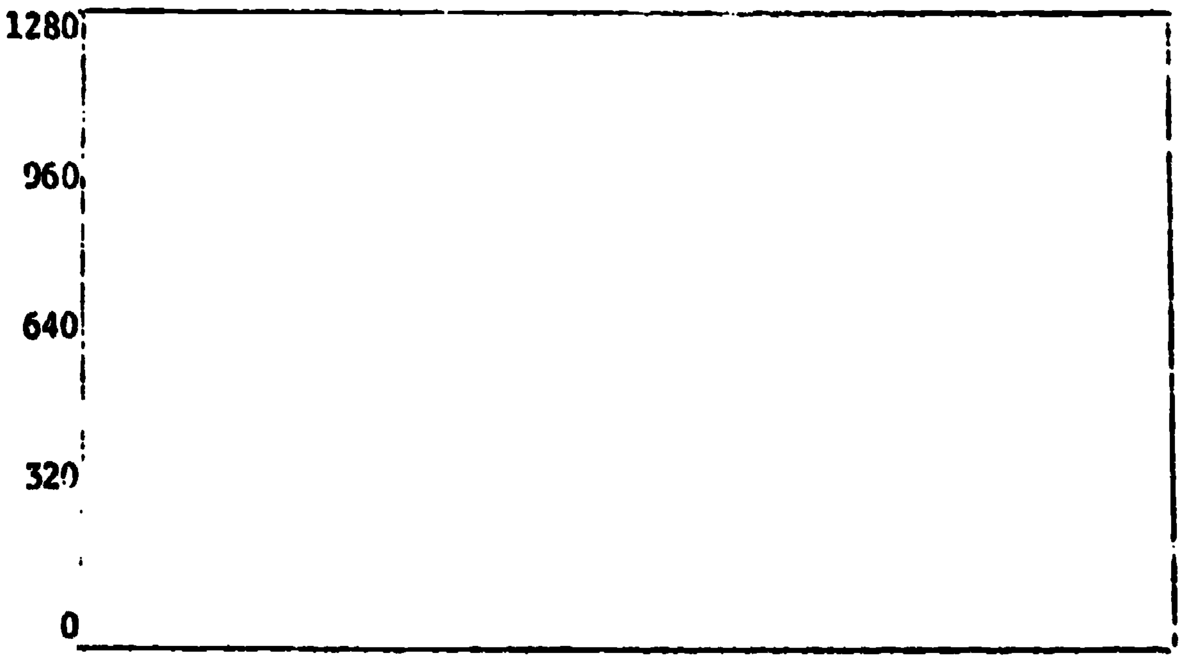
12) "Sort as many pieces of sandpaper from the mixed-up box as you can when I say GO. When I say STOP we will count how many you did correctly."

Student

Evaluator

Work Sample #2 - Sorting Sandpaper	Trial 1		Trial 2		Trial 3		Trial 4	
Following Verbal Instructions and Modelling Behavior	# / 10	T-M / 10	# / 10	T-M / 10	# / 10	T-M / 10	# / 10	T-M / 10
1) Sorts sandpaper one at a time from the mixed-up box into separate boxes.	Y	N	Y	N	Y	N	Y	N
2) Sorts sandpaper by handful into separate boxes.	Y	N	Y	N	Y	N	Y	N
Texture Discrimination								
1) Correctly sorts very coarse sandpaper into separate box.	Y	N	Y	N	Y	N	Y	N
2) Correctly sorts coarse sandpaper into separate box.	Y	N	Y	N	Y	N	Y	N
3) Correctly sorts medium sandpaper into separate box.	Y	N	Y	N	Y	N	Y	N
4) Correctly sorts fine sandpaper into separate box.								
5) Sorts all of one ind of sandpaper.	Y	N	Y	N	Y	N	Y	N

Work Sample #2 - Sorting Sandpaper
Production Graph



Date:

Industrial Norm
Work Adjustment
Daycare

Red (accuracy rate, Total - wrong)

Blue (production rate - Total produced)

Green (number of errors)

Work Sample #3 - Wire Sorting

Purpose: Measure the student's behavior with regard to:

1) ability to discriminate wire width accurately, and
2) increase wire sorting production rate.

Task: Sort mixture of steel and copper wire into two separate piles.

Materials and Equipment:

A) 10 pounds mixed and unattached steel and copper wire
B) time clock
C) data sheet
D) table and samples
F) separator
G) scale for easy measurement

Instructions to Student: Evaluator puts 5 pounds of mixed copper and steel wire on the table in front of the student. A sample of each width will be inserted into two separate pieces of wood and placed in front of the student. The student can use the samples as an additional discrimination cue.

"Your job is to separate the copper and steel wire into two piles."

1) "The steel wire is thicker than the copper wire." (Give the student a piece of each kind of wire to hold and look at.)

2) (Take the piece of steel wire from the student.) "Take the pieces of steel wire and put them in a separate pile here on the table."

3) (Take the piece of copper wire from the student.) "The thin pieces of wire are copper. Take them and put them in a separate pile here on the table."

4) "Remember, the steel wire is thick and the copper wire is thin."

5) Sort as many pieces of copper and steel wire into separate piles as you can. When I say GO, you can start and when I say STOP, we will count the number you did correctly.

Student

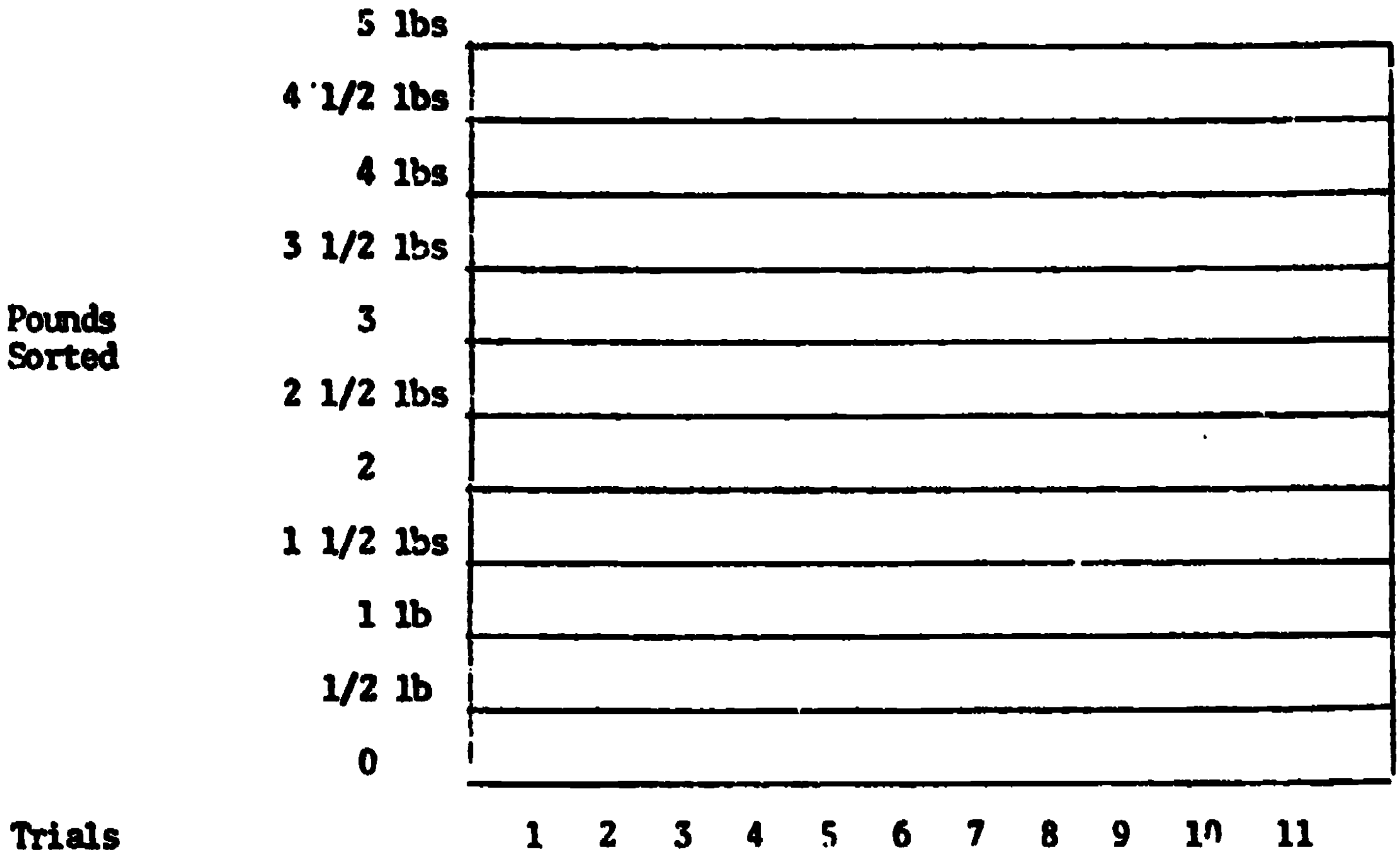
Evaluator

Work Sample #3-Wire Sorting	Trial 1		Trial 2		Trial 3		Trial 4	
Size Discrimination	lbs / 15	Tot lbs / w - 15	lbs / 15	Tot lbs / w - 15	lbs / 15	Tot lbs / w - 15	lbs / 15	Tot l / w -
1) Accurately sorts thick steel wire into pile.	Y	N	Y	N	Y	N	Y	N
2) Accurately sorts thin copper wire into pile.	Y	N	Y	N	Y	N	Y	N
3) Sorts only one kind of wire into separate pile.	Y	N	Y	N	Y	N	Y	N

*Accuracy can be checked by running a magnet over the sorted piles and weighing the amount of steel wire correctly sorted.

Wire Sample #3 - Wire Sorting
Production Graph

Name ______________



Date:

Industrial Norm
Work Adjustment
Daycare

Red (accuracy rate, Total - wrong)

Blue (production rate, total produced)

Green (number of errors)

Work Sample #4 - Labelling and Addressing

Purpose: Measure student's behavior with regard to:

1) accuracy,
2) production rate,
3) ability to follow verbal directions,
4) neatness, and
5) motor ability.

Task: Place labels on the front and back of completed catalogs by use of a moistener.

Materials and Equipment:

A) 10 folded catalogs
B) 10 clientele labels
C) 10 distributor labels
D) 1 moistener

Instructions to Student: Evaluator shows catalogs to students pointing out the labels.

"Your job is to put labels on these catalogs. One label goes on the front and another label on the back."

1) Take a catalog and put it on the table in front of you, front side up. (Demonstrate each step.)

2) Take a client label from this box (pile) and put it upside down on the table next to the catalog.

3) Hold the label flat on the table with two fingers.

4) Pick up the moistener in your other hand. Check to see that the tube has water in it.

5) Hold the moistener like you would a pencil, between your thumb and first finger.

6) Rub the sponge on the moistener across the label. Don't push down too hard or you will get too much water on the label and it won't stick.

7) Turn the label over and place it right side up on the catalog.

8) Make sure you have the label in the right spot and be sure it is on straight.

9) Turn the catalog over.

10) Take a distribution label from this box (pile) and put it upside down on the table next to the catalog.

11) Hold the label flat on the table with two fingers just like the other one.

12) Hold the moistener in your free hand and rub the sponge across the label.

13) Turn the label over and place it right side up on the catalog.

14) Check to be sure you have this label on straight and in the right place.

15) Look at the catalog to be sure you put a label on each side.

16) Place the finished catalog in a pile here on the table.

17) When I say GO, start putting the labels on the catalogs. Work as fast as you can until I say STOP. When I say STOP, we will count how many you did correctly.

Student ______________________ Evaluator ______________________

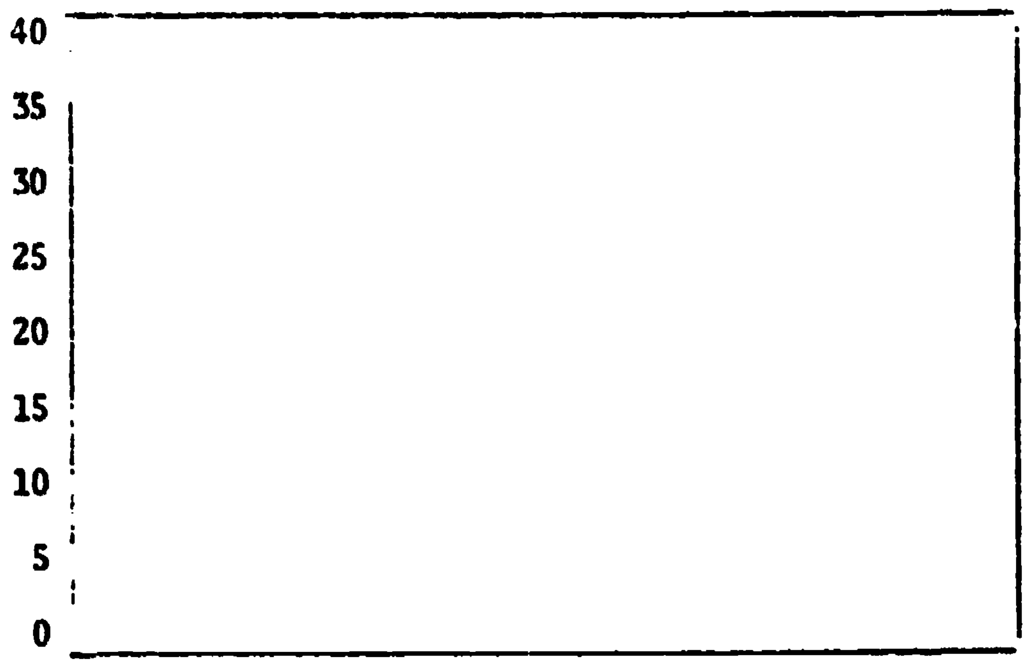
Work Sample #4 - Labelling and Addressing Following Verbal Instructions and Modelling Behavior	Trial 1		Trial 2		Trial 3		Trial 4	
	# / 15	T-W / 15	# / 15	T-W / 15	# / 15	T-W / 15	# / 15	T-W / 15
1) Takes one catalog and places it right side up on the table.	Y	N	Y	N	Y	N	Y	N
2) Takes a client label.	Y	N	Y	N	Y	N	Y	N
3) Places label upside down on table next to catalog.	Y	N	Y	N	Y	N	Y	N
4) Moistens label with sponge.	Y	N	Y	N	Y	N	Y	N
5) Places label right side up on the catalog.	Y	N	Y	N	Y	N	Y	N
6) Turns catalog over.	Y	N	Y	N	Y	N	Y	N
7) Takes distributor label.	Y	N	Y	N	Y	N	Y	N
8) Places label upside down on table next to catalog.	Y	N	Y	N	Y	N	Y	N
9) Moistens label with sponge.	Y	N	Y	N	Y	N	Y	N
10) Places label right side up on catalog.	Y	N	Y	N	Y	N	Y	N
11) Checks catalog to see is two labels have been used	Y	N	Y	N	Y	N	Y	N
12) Places catalogs in pile.	Y	N	Y	N	Y	N	Y	N

Motor Ability								
1) Picks up one catalog at a time.	Y	N	Y	N	Y	N	Y	N
2) Takes one label at a time.	Y	N	Y	N	Y	N	Y	N
3) Holds label on table with two fingers.	Y	N	Y	N	Y	N	Y	N
4) Holds moistener with one hand.	Y	N	Y	N	Y	N	Y	N
5) Rubs moistener across label.	Y	N	Y	N	Y	N	Y	N
6) Picks moistened label off the table.	Y	N	Y	N	Y	N	Y	N

Neatness	Trial 1		Trial 2		Trial 3		Trial 4	
1) Labels are not too wet or they lose their stickiness.	Y	N	Y	N	Y	N	Y	N
2) Labels are placed on the catalog in the right place.	Y	N	Y	N	Y	N	Y	N
3) Labels are put on straight.	Y	N	Y	N	Y	N	Y	N

Work Sample #4 - Labelling and Addressing
Production Graph

Number of Correctly
Labeled Catalogs



Date:

Industrial Norm
Sheltered Workshop
Daycare

Red (accuracy rate, Total - wrong)

Blue (production rate, total produced)

Green (number of errors)

Work Sample #5 - Packaging and Packing Library Cards

Purpose: Measure the student's behavior with regard to:

1) ability to discriminate color,
2) ability to use hand tools,
3) ability to use hands independently,
4) ability to count, and
5) increase packaging and packing production rate.

Task: Package cards into 500 card packs, count the finished packs, and pack them into a box.

Materials and Equipment:

A) 1600 3" x 5" library cards - green
B) 32 3" x 5" library cards - yellow
C) 2 wooden jigs 3" x 4"
D) 2 large scotch tape dispensers with tape
E) 2 boxes for packing

Instructions to Students: Evaluator indicates cards, jig, tape dispenser, and packing box to student.

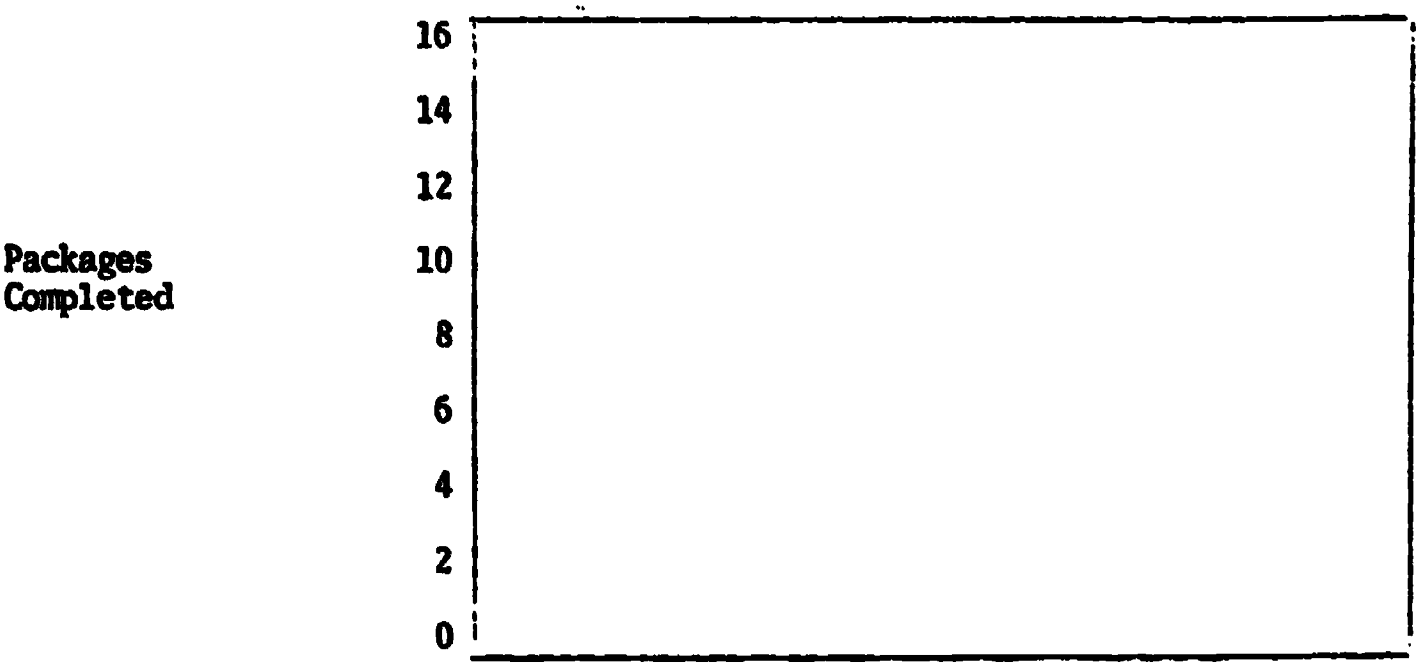
"Your job is to take 50 cards from this stack and package them with paper and scotch tape. Then place the packs of cards into this box and count the finished packs."

1) The 50 green cards are separated by a yellow card.
2) (Take a piece of wrapping paper.) Place this piece of paper in the jig.
3) Remove the yellow card and place it on the table here.
4) Take the green cards down to the yellow card.
5) Do not pick up the yellow card.
6) Place cards on paper in the jig.
7) Fold paper up from bottom of jig.
8) Fold paper down from top of jig.
9) Hold paper together with one hand.
10) With other hand, tear off piece of scotch tape.
11) Tape paper on cards.
12) Remove pack of cards from jig.
13) Place finished pack into box.
14) Package and pack as many sets of 50 cards as you can. When I say GO you can start and when I say STOP, you will count how many you did correctly.

Student | Evaluator

Work Sample #5 - Packaging and Packing Library Cards	Trial 1		Trial 2		Trial 3		Trial	
Use of Hand Tools, Color Discrimination, Counting and Independent Use of Hands	# / 10	T-W / 10	# / 10	T-W / 10	# / 10	T-W / 10	# / 10	T-
1) Accurately picks up 50 cards.	Y	N	Y	N	Y	N	Y	
2) Accurately removes yellow card.	Y	N	Y	N	Y	N	Y	
3) Places yellow card into pile.	Y	N	Y	N	Y	N	Y	
4) Accurately places paper in jig.	Y	N	Y	N	Y	N	Y	
5) Accurately places 50 cards in jig.	Y	N	Y	N	Y	N	Y	
6) Accurately folds paper over cards.	Y	N	Y	N	Y	N	Y	
7) Tears tape off dispenser with one hand.	Y	N	Y	N	Y	N	Y	
8) Holds paper folded over cards with other hand.	Y	N	Y	N	Y	N	Y	
9) Accurately tapes paper on cards.	Y	N	Y	N	Y	N	Y	
10) Removes finished packs from jig.	Y	N	Y	N	Y	N	Y	
11) Places finished packs into box.	Y	N	Y	N	Y	N	Y	
12) Accurately counts finished packs.	Y	N	Y	N	Y	N	Y	

Work Sample #5 - Packaging and Packing Library Cards
Production Graph



Sessions:

Date:

Industrial Norm
Work Adjustment
Daycare

Red (accuracy rate, Total - wrong)

Blue (production rate - total produced)

Green (number of errors)

Work Sample #6 - Inspecting, Counting, and Boxing Library Files

Purpose: Measure student's behavior with regard to:

1) ability to discriminate form,
2) ability to count, and
3) increase inspecting, counting, and boxing production rate.

Task: Inspect files, count 12 files and pack them into a cardboard box.

Materials and Equipment:

A) 150 library files
B) 10 cardboard files
C) 1 large cardboard box for discards
D) 1 large cardboard box for completed boxes

Instruction to Students: Evaluator shows library files to student.

"Your job is to inspect these files, count them into piles of 12, and place them into this box."

1) See this file; the ink is smeared on this file. Put it into this box to be thrown away.

2) See this file; this flap is torn. Put it into this box to be thrown away.

3) See this file; the printing is bad. Put it into this box to be thrown away.

4) See this file; this file has no smeared ink, the printing is good, and it doesn't have any flaps torn off. Put this file here on the table.

5) Put 5 more files like this one on top of the first with the glued side up. (Evaluator indicates the glued side.)

6) Now you have 6 files in this pile with the glued side up.

7) Put 6 good files with the glued side down on top of these 6.

8) When you have 12 good files in this pile, put them into this cardboard box and place this box into this large box.

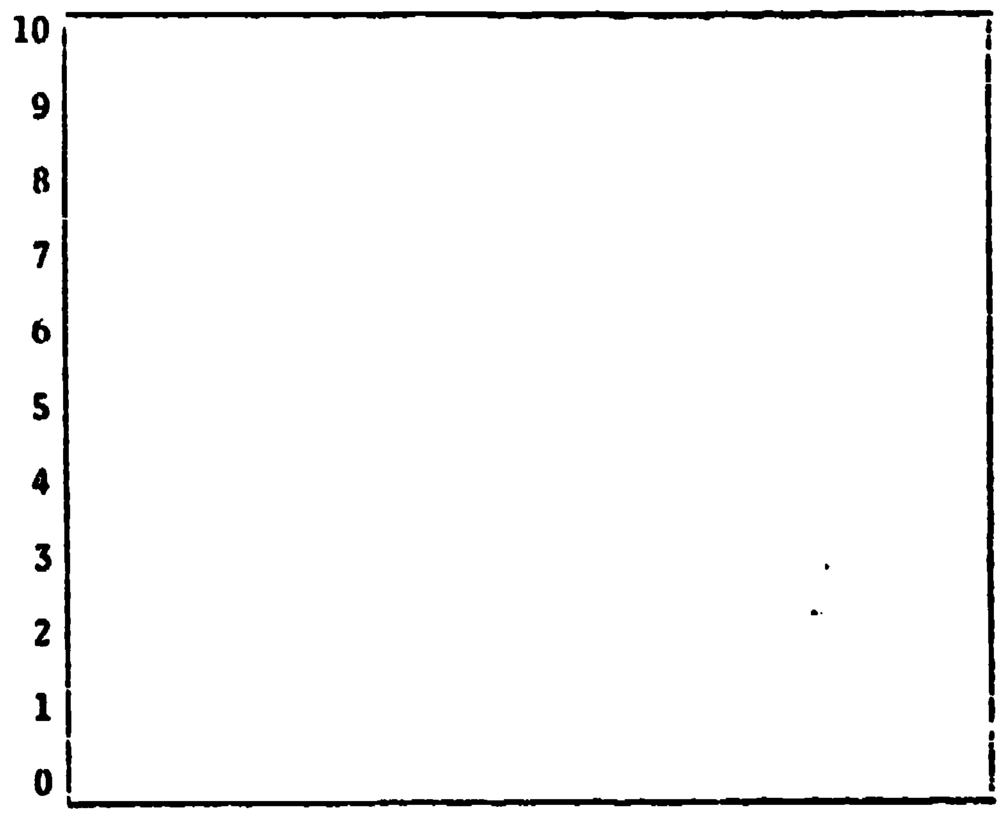
9) Inspect and box as many files as you can. When I say GO, you can start and when I say STOP, we will count how many you did correctly.

Student Evaluator

Work Sample #6 - Inspecting, Counting and Boxing Library Files	Trial 1		Trial 2		Trial 3		Trial 4	
Form Discrimination, Counting	120/10	120-w/10	120/10	120-w/10	120/10	120-w/10	120/10	12[illegible]
1) Inspect files for defects and discard bad ones.	Y	N	Y	N	Y	N	Y	N
2) Inspect files for defects and place good ones in pile.	Y	N	Y	N	Y	N	Y	N
3) Can place 6 good files glued side up in a pile.	Y	N	Y	N	Y	N	Y	N
4) Can place 6 good files glued side down on top of first 6.	Y	N	Y	N	Y	N	Y	N
5) Can place 12 files correctly into cardboard box.	Y	N	Y	N	Y	N	Y	N
6) Can place this box into large box.	Y	N	Y	N	Y	N	Y	N

Work Sample #6 - Inspecting, Counting and Boxing Library Files
Production Graph

Boxes Packed



Sessions:

Date:

Industrial Norm	10 boxes		Red (accuracy rate, Total - wrong)
Work Adjustment	7 boxes		
Daycare	1 box		Blue (production rate, total produced)
			Green (number of errors)

Work Sample #7 - Packaging Fish Bait

Purpose: Measure the student's behavior with regard to:

1) ability to control and coordinate finger movements accurately, and

2) increase packaging fish bait production rate.

Task: Insert fish hooks accurately into bait, pile four completed strips of bait into a pile, fold all four strips (together) into thirds, and place this folded bait into a glass jar.

Materials and Equipment:

A) 30 small glass jars
B) 120 pieces of leather (fish bait) pre-cut with two small holes
C) 50 fish hooks #3/0
D) 1 cardboard box for packing jars

Instructions to Students: Evaluator indicates materials to students.

"Your job is to put fish hooks into this bait, pile four completed strips of bait into a pile, fold all four strips into thirds, and place this folded bait into a glass jar."

1) Evaluator takes a piece of bait and places it in front of student. (Notice this bait looks like a fish. See the tail end. See the head end.)

2) Notice this bait has two small holes.

3) Pick up a strip of bait.

4) Pick up this strip of bait in one hand.

5) Pick up one fish hook with your other hand.

6) Put hook into a hole on right side of bait.

7) Pull hook through hole on left side of bait.

8) Pull hook tightly into bait.

9) Place bait with hook on table.

10) Flatten hook against bait.

11) Complete three more pieces of bait with the fish hooks.

12) Place each completed piece of bait on the first one until you have four pieces of bait together.

13) Pick up all four pieces of bait together.

14) Fold 1/3 of bait under with left hand.

15) Fold 1/3 of bait under with right hand.

16) Place completed bait into glass jar (hooks up).

17) Complete as many jars of bait as you can. When I say GO, you can start and when I say STOP, we will count the number of completed jars you did correctly.

Student | Evaluator

Work Sample #7 - Packaging Fish Bait	Trial 1		Trial 2		Trial 3		Trial 4	
Finger Dexterity	6/12	6-w/12	6/12	6-w/12	6/12	6-w/12	6/12	6-w/12
1) Places pieces of bait on table with tail on left.	Y	N	Y	N	Y	N	Y	N
2) Picks up bait with one hand.	Y	N	Y	N	Y	N	Y	N
3) Picks up fish hook with other hand.	Y	N	Y	N	Y	N	Y	N
4) Puts fish hook into hole on right side (head side) of bait.	Y	N	Y	N	Y	N	Y	N
5) Pulls fish hook through hole on left side (tail) of bait.	Y	N	Y	N	Y	N	Y	N
6) Pulls hook tightly into bait.	Y	N	Y	N	Y	N	Y	N
7) Places bait with hook on table.	Y	N	Y	N	Y	N	Y	N
8) Flattens hook against bait.	Y	N	Y	N	Y	N	Y	N
9) Completes 3 more pieces of bait.	Y	N	Y	N	Y	N	Y	N
10) Places all four pieces of bait into a pile according to directions.	Y	N	Y	N	Y	N	Y	N
11) Picks up all four completed pieces of bait together.	Y	N	Y	N	Y	N	Y	N
12) Folds 1/3 of bait (tail side) under.	Y	N	Y	N	Y	N	Y	N
13) Folds 1/3 of bait (head side) under.	Y	N	Y	N	Y	N	Y	N
14) Places completed bait into glass jar with hook pointing up.	Y	N	Y	N	Y	N	Y	N

Work Sample #7 · Packaging Fish Bait
Production Graph

Jars of Bait Completed

7
6
5
4
3
2
1
0

Sessions:

Date:

Industrial Norm	6 jars	Red (accuracy rate, Total - wrong)
Work Adjustment	4 jars	
Daycare	1 jar	Blue (production rate, total produced)
		Green (number of errors)

Work Sample #8 - Colored Paper Collating

Purpose: Measure the student's behavior with regard to:

1) ability to match the behavior of a model,
2) ability to plan and organize, and
3) increase collating production rate.

Task: To look at a four-page booklet and make others just like it.

Materials and Equipment:

A) 40 pieces of blue paper
B) 40 pieces of yellow paper
C) 40 pieces of pink paper
D) 40 pieces of white paper
E) 1 3-hole punch
F) 1 stapler and staples

Instructions to Student: Evaluator points to papers, collator rack, stapler, and punch.

"Your job is to make a booklet like this."

1) Show a model of a four-page booklet (first yellow, second blue, third pink, and fourth white) with three holes punched on left side and stapled once in left-hand corner.

2) You are to make as many booklets like this one as you can. When I say GO, you can start and when I say STOP, we will count how many booklets you made correctly. Evaluator does not give verbal instructions because student is to follow a model.

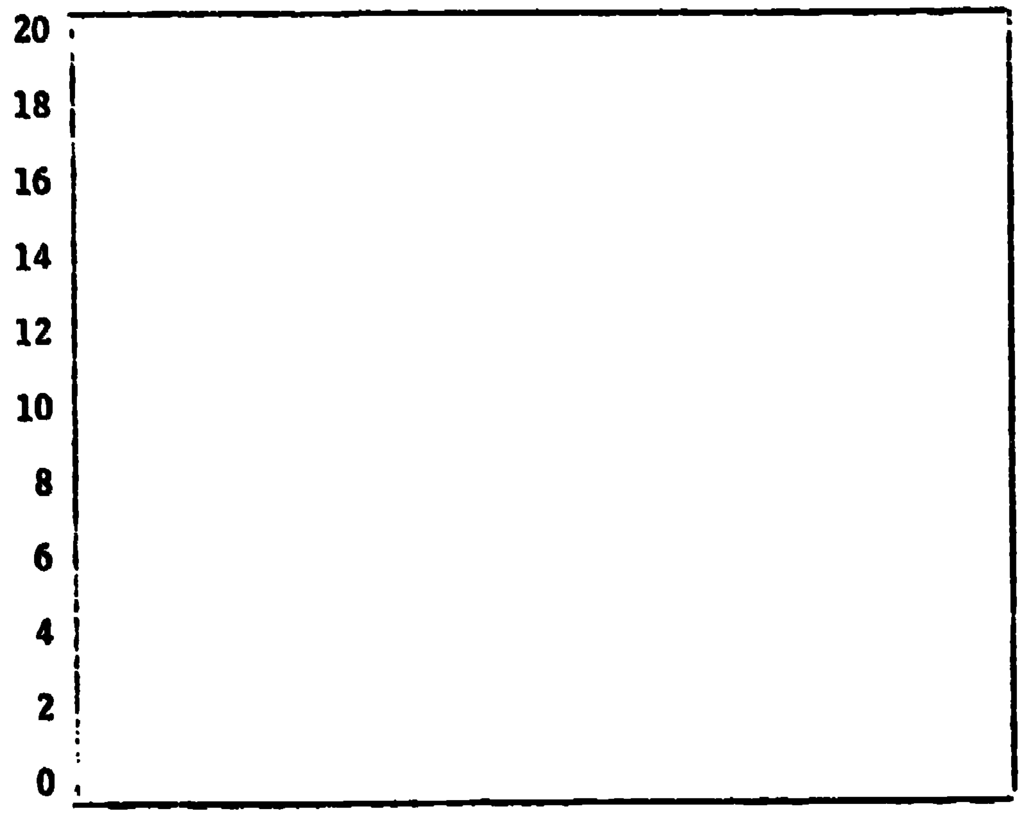
Student

Evaluator

Work Sample #8 - Collating by Following a Model	Trial 1		Trial 2		Trial 3		Trial 4	
Following a Model	# / 10	#-W / 10	# / 10	#-W / 10	# / 10	#-W / 10	# / 10	#-W / 10
1) Places white paper in well #1 of collator.	Y	N	Y	N	Y	N	Y	N
2) Places pink paper in well #2 of collator.	Y	N	Y	N	Y	N	Y	N
3) Places blue paper in well #3 of collator.	Y	N	Y	N	Y	N	Y	N
4) Places yellow paper in well #4 of collator.	Y	N	Y	N	Y	N	Y	N
5) Collates 4 pages from well #1 to well #4.	Y	N	Y	N	Y	N	Y	N
6) Straightens 4 pages.	Y	N	Y	N	Y	N	Y	N
7) Staples 4 pages in left-hand corner.	Y	N	Y	N	Y	N	Y	N
8) Uses punch to make three holes on left side.	Y	N	Y	N	Y	N	Y	N
9) Places finished booklets into pile on table.	Y	N	Y	N	Y	N	Y	N

Work Sample #8 - Collating by Following a Model
Production Graph

Booklets Completed



Sessions:

Date:

Industrial Norm
Work Adjustment
Daycare

Red (accuracy rate, Total - wrong)

Blue (production rate, total produced)

Green (number of errors)

Work Sample #9 - Sealing Plastic Bagged Spoons with a Heat Sealer

I. General Behavioral Objective: The student shall be able to demonstrate his understanding of the heat sealing job by being able to follow and complete the directions given for the (1) feeder's, (2) sealer's and (3) packer's duties.

II. Heat Sealer Tasks:

A. (3) Jobs (components)

1. Feeder

a. quality check spoons for -

1) rips
2) wrinkles
3) dirt
4) bowl of spoon facing down with the handle pointing up toward the open end of the spoon

b. timer

1) watches clock and calls time at 15 minute intervals

2. Heat Sealer

a. plugs in heat sealing machine to lower wall socket - watches temperature gauge until it registers 200°

b. works the heat sealer to seal the bagged spoons

c. quality checks seal on sealed, bagged spoon

3. Packer

a. quality checks seal, spoon, and bag

b. places the finished product (sealed, bagged spoon) in box

B. Instructional materials used in heat sealing project:

1. box of bagged spoons

2. heat sealer machine

3. (2) empty boxes

4. time clock

5. tables

6. signs reading:

a. "heat sealer"

b. "rejects"

c. 200^{o}

C. Speaking and reading vocabulary necessary for successful completion of heat sealer project:

1. foot pedal

   a. manual

2. switch

   a. automatic

3. wall socket

4. temperature gauge

5. presses

6. vending machine

7. rejects

8. seal

9. machine

10. spoon

    a. bowl

    b. handle

11. bag

    a. top

    b. bottom

D. Mathematical skills necessary for completion of heat sealing program:

1. tell time so as to call "time" in 15 minute segments

2. read 200^{o} on temperature gauge

E. Social skills necessary for successful completion of heat sealing job:

1. respond to verbal directions of teacher

2. duplicate modeled directions given by teacher

3. work in groups of 3 - request assistance - respond to directions promptly

4. responsible to attend to one portion of job at a time and remain at assigned work station for set number of minutes

III. Evaluation:

A. Actual completion of program components

B. Quality of finished products

C. Amount of assistance required to carry out all components of the program

IV. Method of teaching components of the heat sealing task:

A. Whole group discussion of:

1. What is a machine?

2. What is a heat sealer?

3. Where do we get the heat sealer machine?

4. Is it an expensive machine?

5. Do we need safety rules to use it?

6. Where do the finished, sealed spoons go?

7. What will the spoons be used for?

8. What is considered a good quality job?

9. Discuss parts of machine and other equipment used.

10. Demonstration (by teacher) of how parts of machine are worked.

11. Discussion of vocabulary and definitions necessary to complete the various components.

B. Whole group discussion of:

1. Feeder's Job -

a. What is his job?

1) quality checks the bagged spoons
2) timer

b. Verbal directions of feeder's job = pick up the bagged spoon from the box and quality check it - then hand it to the heat sealer. If there is anything wrong with it, put it in the "reject box."

2. Heat Sealer's Job -

   a. What is his job?

      1) plugs in machine to wall socket and waits until temperature gauge reads 200°.
      2) works heat sealer to seal the bagged spoons
      3) quality checks the seal

   b. Verbal directions of heat sealer's job -
      Take the bagged spoon in the right hand from the feeder - put both hands on the bowl of the spoon with the handle facing up and place it between the two presses just so that you can see the top of the spoon. Press the foot pedal with your right foot and wait until the top press has gone down and then come back up. Take your foot off the pedal and remove the sealed bagged spoon from the press. Quality check the seal of the bagged spoon and if anything is wrong with it, put it in the "reject box." If nothing is wrong with it (ripped, torn, dirty, wrinkled, etc.) hand it to the packer with your left hand.

3. Packer's Job -

   a. What is his job?

      1) quality checks seal, bag, and spoon
      2) places the finished quality product (clean, neat, sealed, bagged spoon) in packing box

   b. Verbal directions of packer's job -
      Take the sealed bagged spoon and quality check it to make sure it is sealed properly, clean, neat, and unwrinkled and if it is, put it in the box. If something is wrong with it - not a quality bagged spoon - put it in the "reject box."

C. Teacher demonstrates to groups of (3) the parts of the heat sealer machine and how to work it.

D. Teacher models all (3) jobs and how all (3) jobs are rotated.

FEEDER
PACKER
H. SEALER

PACKER
H. SEALER
FEEDER

FEEDER
H. SEALER
PACKER

ROTATION
SYSTEM
AT
15
MINUTE
INTERVALS

Work Sample #10 - Graber Drapery Hook Project

I. Objectives:

-to enable a student to follow directions and retain them for a long duration.

-to enable a student to work cooperatively on an assembly line; to tolerate job switches within the assembly line; to strive for accuracy on each task of the assembly line, and to strive for and maintain a high production rate.

-to facilitate the student's utilization of new terminology related to the task.

-to develop small motor skills necessary to manipulate the drapery hooks and labels.

-to develop adequate visual perception for quality checking finished products and distinguishing parts of each component of the task.

II. Specific programs to foster approximations to the objectives stated:

A. Materials used in assembling Graber Drapery Hook Packages:

1. Components of task:
   - drapery hooks
   - plastic bags
   - labels

2. Machines:
   - loading tray
   - filling chute
   - right-side stapler
   - left-side stapler
   - one-hole punch

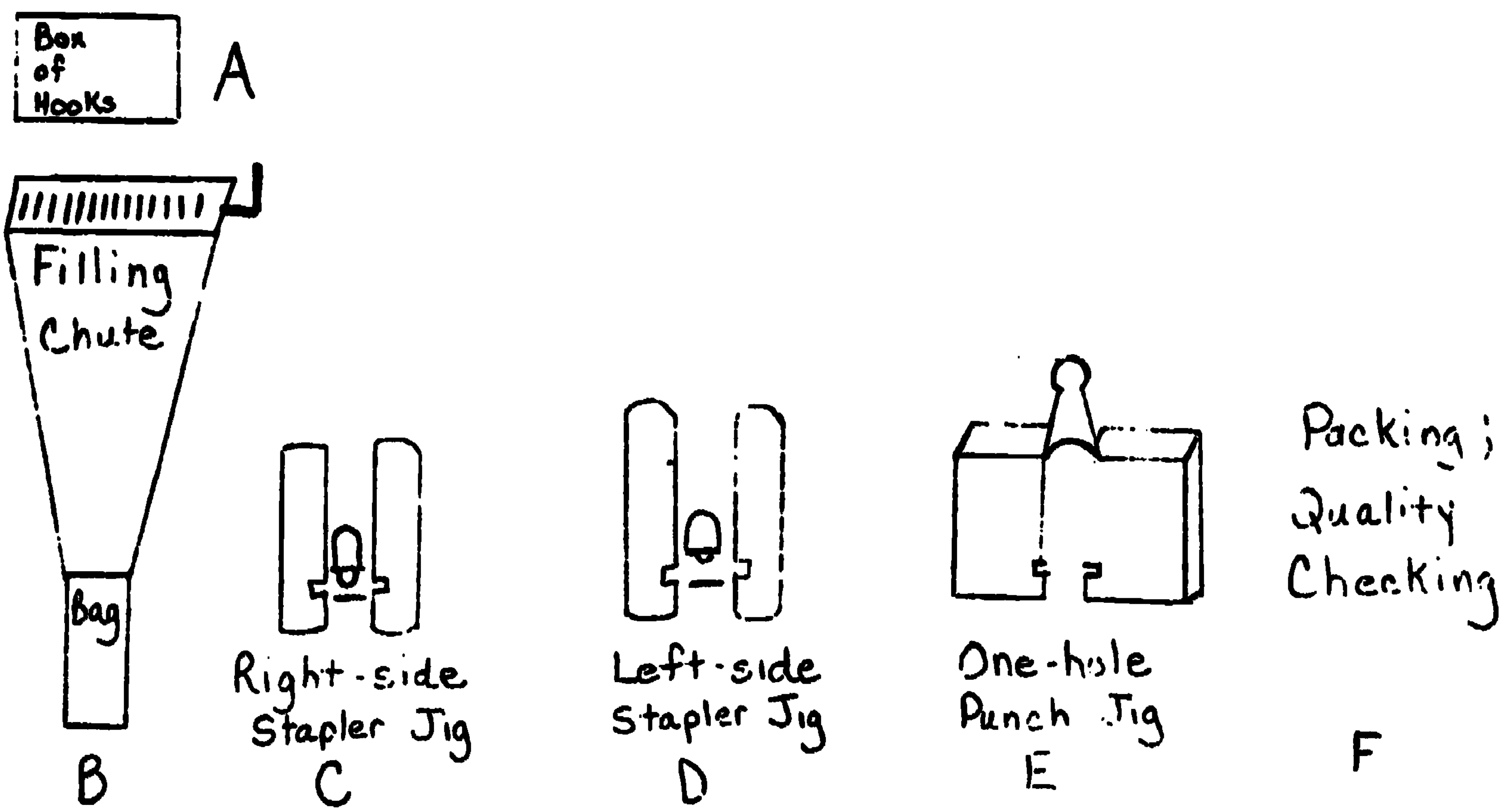
B. Vocabularly

HOOK
rounded side of hook
flat side of hook
open end of hook
pointed end of hook
BAG
open end of bag
sealed end of bag
front of bag
back of bag
LABEL
front of label
back of label
flaps of label
folded edge of label
staple line on label
STAPLERS
right-side stapler
left-side stapler
red slot in jig

right staple
left staple
FILLING CHUTE
loading tray
chute
handle
narrow end of chute
slots in loading tray
ONE-HOLE PUNCH JIG
handle of one-hole punch
one-hole punch
(CONCEPTS)
even (label)
straight (bag)

C. Social skills necessary for working successfully on an assembly line:
respond to verbal directions
cooperate with fellow workers
verbally request assistance and additional materials

D. Machine set-up:



III. Evaluation

A. Results of project

Each student in Groups 1,2,3,4 was able to perform at least one task on the assembly line. Production progress for each group was tabulated on a chart that contained date, amount of time worked, and number of finished packages, and amount of money production was worth.

B. Reinforcement for project progress

-Students counted aloud their finished packages at the end of each work session, discussed the monetary worth of their production, and saw all their production information written on their chart.

-Students from Group 1 also used a production graph to see whether their production went up or down from the day before.

-Students took a field trip to Wolf-Kubly &Hirsig to see their work on display at a retail store.

IV. Actual teaching of task

INTRODUCTION

This is an assembly line job. Each person will do only part of the whole job. Each person is responsible for his part of the job. (Discussion of assembly line) We will be doing a quality job. There will be no rejects or mistakes that we will send out to a store.

EXPLANATION OF COMPONENTS AND MACHINES (as in II)

EXPLANATION OF INDIVIDUAL JOBS

Person A

faces the side of the filling chute
has a box of hooks in front of him
picks up one hook and places it in slot of loading tray with the pointed edge of hook toward back
puts a hook into each slot of the loading tray

Person B

faces front of filling chute
h has pile of bags to his right
takes o ne bag, slides between fingers to open and, usingboth hands, puts narrow end of chute into open bag
when all slots on the loading tray are filled, "B" pulls the handle slowly and evenly toward himself
moves bag down, away from chute while holding top of bag
passes bag to his right to Person C

Person C

faces front of right-side stapler jig
has a pile of labels to his right
receives bag from person B
picks up one label (front towards him, folded edge up)
slides label onto top of bag (front of label over front of bag); folded edge of bag touches top of bag
slides bag, label first, into slot of jig, using both hands

when in place holds only with left fingers on left corner of label
presses stapler with right hand; pulls bag carefully out of slot with both hands; checks staple
passes bag to person D

Person D
faces front of left-side stapler jig
receives bag from person C
slides bag, label first, into slot of jig, using both hands (until labeled bag can go no farther into slot)
when in place, holds only with left fingers on left corner of label
presses stapler with right hand; pulls bag carefully out of slot with both hands.
checks position of staple; passes bag to Person F

Person E
faces front of one-hole punch jig
takes bag from Person D
slides bag, label first, into the slot of the jig using both hands
holds only with left fingers on left corner of label
presses handle of one-hole punch down with right hand and releases it.
removes bag carefully from slot with both hands
checks to see that the hole is clear
passes bag to person F

Person F
faces packing box.
receives finished bag from person E
checks to make sure that package has both staples in correct place, hole is in correct place
packs finished package carefully into packing box

DATE: HRS WORKED: PRODUCTION:	DATE: HRS WORKED: PRODUCTION:	DATE: HRS WORKED: PRODUCTION:	DATE: HRS WORKED: PRODUCTION:	DATE: HRS WORKED: PRODUCTION:
DATE: HRS WORKED: PRODUCTION:	DATE: HRS WORKED: PRODUCTION:	DATE: HRS WORKED: PRODUCTION:	DATE: HRS WORKED: PRODUCTION:	DATE: HRS WORKED: PRODUCTION:
DATE: HRS WORKED: PRODUCTION:	DATE: HRS. WORKED: PRODUCTION:	DATE: HRS WORKED: PRODUCTION:	DATE: HRS WORKED: PRODUCTION:	DATE: HRS WORKED: PRODUCTION:

SAMPLE RECORD OF NUMBER OF TASKS TO WHICH EACH STUDENT WAS EXPOSED

TASK TAUGHT	
1. Collating - task: Collate 4 page catalogs using a collating rack and place completed catalogs in a cross-hatched pile.	X
2. Sorting sandpaper - task: Sort 4 grades of sandpaper ranging from extra coarse to fine from one pile into 4 boxes.	X
3. Wire sorting - Task: Sort mixture of steel and copper wire into 2 separate piles.	X
4. Packaging and packing library cards - task: Package cards into packs of 50; count the finished packs and pack them into a box.	
5. Spoon bagging - task: Place a plastic spoon into a plastic bag.	X
6. Heat sealing bagged spoons - task: Sealing bagged spoons in a heat sealer.	
7. Packaging Graber hooks - Task A: Fill a loading device with 14 drapery hooks.	X
Task B: Place a label on package and insert package into jig with stapler to staple right side of package.	X
Task C: Insert package into jig with stapler to staple left side of package.	X
Task D: Place package into jig with one hole punch and punch out hole and place finished package into box.	X
8. Sorting labels and coupons - task: Sort boxes of labels and coupons into marked paper bag. At least 100 different labels and coupons are sorted by recognizing label stapled to bag.	X
9. Sorting Birdseye labels - task: Sort at least 57 different kinds of Birdseye labels by recognizing label stapled to bag.	
10. Pleater hooks assembly - task: Assemble a two piece metal and plastic pleater hook with the use of a jig.	X
11. Resealing potato chip bags - task: Use plastic cement to close faulty end of potato chip bags.	X
12. Stuffing envelopes - task: Stuff window envelopes with an insert and return envelope so that the receiver's name and address show through correctly.	X
13. Bolt discrimination - task: Sort bolts according to cumulative bolt sorting task that begins with two bolts along three dimensions and ends with seven bolts along eight dimensions.	X
14. Collating and assembling a newsletter - task: Collate and staple a ten to twelve page newsletter.	X
15. Fabric discrimination - task: Match different fabrics according to texture, color and pattern.	

SUMMARY DATA SHEET OF TASK TO WHICH EACH STUDENT WAS EXPOSED

Student	
S1	Tasks 1, 2, 5, 7a, 7d, 12, 14
2	Tasks 1, 2, 5, 6, 7a, 7b, 7c, 7d, 8, 10, 11, 12, 14
3	Tasks 1, 2, 5, 7a, 7c, 7d, 12
4	Tasks 1, 2, 5, 7a, 7b, 7c, 7d, 8, 10, 11, 12, 13, 14, 15
5	Tasks 1, 2, 4, 5, 7a, 7c, 7d, 8, 10, 11, 12, 14
6	Tasks 1, 2, 3, 4, 5, 6, 7a, 7b, 7c, 7d, 8, 1, 11, 12, 13, 14
7	Tasks 1, 2, 5, 7a, 7d, 8, 10, 11, 12, 13, 14
8	Tasks 1, 2, 3, 5, 7a, 7b, 7c, 7d, 8, 10, 11, 12, 13, 14
9	Tasks 5
10	Tasks 1, 2, 3, 5, 7a, 7b, 7c, 7d, 8, 9, 10, 11, 12, 13, 14
11	Tasks 1, 2, 5, 7a, 7b, 7c, 7d, 8, 10, 11, 12, 13, 14

GROUP II

Student	
12	Tasks 1, 2, 3, 5, 7a, 7b, 7c, 7d, 10, 11, 12, 13, 14
13	Tasks 1, 5, 7c, 7d, 12, 14
14	Tasks 2, 5, 7a, 12, 14
15	Tasks 1, 2, 5, 12, 14
16	Tasks 1, 5, 7a, 7d, 13
17	Tasks 1, 2, 3, 5, 12, 14
18	Tasks 1, 5, 12, 14
19	Tasks 1, 2, 5, 7a, 12, 14
20	Tasks 1, 2, 5, 7a, 7b, 7c, 7d, 12
21	Tasks 1, 2, 5, 7a, 7b, 7c, 7d, 8, 10, 11, 12, 14
22	Tasks 1, 2, 5, 7c, 7d, 10, 12, 14

GROUP III

Student	
22	Tasks 1, 2, 4, 5, 7a, 7d, 8, 9, 10, 11, 12, 13, 14
23	Tasks 1, 2, 3, 4, 5, 7a, 7b, 7c, 7d, 8, 9, 10, 11, 12, 13, 14
24	Tasks 1, 2, 3, 4, 5, 7a, 7c, 7d, 8, 9, 10, 11, 12, 13, 14
25	Tasks 1, 2, 3, 4, 5, 7a, 7b, 7c, 7d, 8, 9, 10, 11, 12, 13, 14
26	Tasks 1, 2, 3, 4, 5, 7a, 7b, 7c, 7d, 8, 9, 10, 11, 12, 13, 14
27	Tasks 1, 2, 3, 4, 5, 7a, 7b, 7c, 7d, 8, 9, 10, 11, 12, 13, 14
28	Tasks 1, 2, 3, 4, 5, 6, 7a, 7b, 7c, 7d, 8, 9, 10, 11, 12, 13, 14
29	Tasks 1, 2, 3, 4, 5, 6, 7a, 7b, 7c, 7d, 8, 9, 10, 11, 12, 13, 14

Development of specific pre-vocational behaviors in specific students

In addition to providing exposure and rather cursory training to many students on many tasks, attempts were made to select individual students and investigate specific parameters of work behavior. The following five papers are included as examples of how several necessary vocational behaviors were investigated. The primary purpose of the following projects was to teach the students involved to perform the work task as well as they were capable. Incidently, however, the staff was also concerned with delineating specific teaching techniques and measurement procedures that might be utilized effectively with other students on many different tasks.

Each paper del[illegible]ates the particular work behavior of concern, the rationale for developing t[illegible] behavior, a description of the students, materials, tasks and teaching procedure as well as a report of results and a discussion. While it is possible to abstract the content of the papers, it is felt that the intent of the papers will be more comprehensible and informative to the reader if they are presented in their entirety. It should also be noted that the five papers, as they are presented below, have been generated over the past two years and have been submitted and/or published in several professional journals.

Abstract

Work arrangements (individual and assembly line) and reinforcement (social only and social plus tangible) were manipulated to increase the production rates of six trainable level students in an envelope stuffing task. Individual work settings consistently resulted in higher production rates than assembly line settings regardless of the reinforcement contingencies in effect. Production rates also consistently improved when tangible reinforcement in the form of components of a "banana split" was successively made contingent on attaining a student or group specified goal. These environmental manipulations were successful in part because the teachers specified their instructional objectives in a way that required direct measurement of their students' behavior.

Increasing Individual and Assembly Line Production Rates of Retarded Students[1]

Lou Brown, Sylvester Johnson, Eve Gadberry and Nancy Fenrick

University of Wisconsin and Madison Public Schools

One of the major objectives of school programs for "trainable level" retarded and severely "emotionally disturbed" adolescent students is to contribute to the development of functional vocational behaviors.

Crosson (1969) delineated two approaches to providing work for persons not expected to be able to compete successfully in the open job market. The first approach is to find work that those with severe disabilities can perform. While this approach may have short term benefits (e.g. "doing something is better than doing nothing," "everyone has to start somewhere") the long term benefits may be negligible. For example, acquisition of new work skills may be minimized and potentially competitive workers may not be challenged to perform to the best of their ability. Crosson's second approach is to take available work and assume the responsibility of training the students to become efficient at performing the required tasks. This alternative approach more clearly represents the competitive job market in which an employer seeks trained workers or designs training programs to develop, in his workers, the skills he feels are necessary.

[1]This demonstration was supported in part by NICHD Grant 5 P01 HD 03352 to the University of Wisconsin Center on Mental Retardation and by the State of Wisconsin, Title VI-A, ESEA, Project #00030 in cooperation with the Madison Public Schools.

In accordance with Crosson's second and more recommended approach to developing functional vocational skills, a work task that is generally available in the competitive job market, envelope stuffing, was solicited by a public school staff. Ordinarily the training problems confronted when attempting to simulate the demands of a natural work environment are: first, to teach the students to perform the components of the work task and second, to arrange the work environment in such a way as to maximize the efficiency of the students' work performance. Because the students in this demonstration had already indicated that they could perform the components of the work task, the problem here was that of improving work efficiency. Work efficiency was operationally defined as the number of envelopes stuffed in a specified time period, i.e. rate of production.

Two procedures were used in an attempt to improve work efficiency or increase the rate of production. The first procedure was concerned with investigating production rates under two work arrangements: 1) individual production in which one person completes all of the components of the task and 2) assembly line production in which each student is responsible for only one component of the task. The second procedure was concerned with investigating production rates under two different kinds of reinforcers: 1) social only and 2) social plus tangible.

METHOD

Students

Four male and two female students, enrolled in public school special education classes, were involved in this demonstration. The students, ranging in age from 15 to 20, had been evaluated by certified school psychologists. Three had obtained IQs ranging from 38 to 45 and were diagnosed as trainable mentally retarded. The remaining three had obtained IQs ranging from 55 to 67 and were diagnosed as schizophrenic.

Work Setting

Work was performed in a public school classroom at tables capable of seating six students. While two classes of ten students each were involved in the same envelope stuffing activity in the classroom, the six students involved in the demonstration were seated at a work station about ten feet from where the other students were working. Two teachers and two teacher aides supervised the entire classroom with one teacher assigned specifically to the six students in this demonstration.

Work periods were divided into 15 minute sessions, each beginning and ending with the teacher ringing a bell. When the terminating bell rang, the students completed the envelope on which they were working. The teacher then counted the completed envelopes and recorded the total next to each student's name on the chalkboard.

Since all students had been engaged in the envelope stuffing activity for three days at an average of two hours daily prior to the start of this demonstration, it had been established that each student could adequately perform all components of the task.

<u>Work Task</u>

The task materials consisted of a large windowed envelope into which was to be stuffed an addressed envelope, a letter, and a sheet of seals; all of which were folded to size.

Individual stuffing. The six students sat around the table with each one having his own four piles of supplies (sheet of seals, letter, addressed envelope, and windowed envelope). The task required:

1. Placing the sheet of seals on the letter
2. Placing the addressed envelope on the letter and seals
3. Stuffing the three piece pile into the windowed envelope so that the address could be read
4. Tucking in the envelope flap
5. Placing the envelope in a small box

Assembly line stuffing. The six students seated around the same table worked in an assembly line in the following way:

1. The first worker placed the sheet of seals on the letter
2. The second worker placed the addressed envelope on the letter and seals
3. The third and fourth workers stuffed the three piece piles into windowed envelopes so that the address could be read
4. The fifth and sixth workers tucked in the envelope flaps and placed the envelopes in a small box

<u>Procedure</u>

<u>Individual and assembly line production rates under social reinforcement and feedback</u>. The initial portion of the demonstration consisted of 18 fifteen minute work sessions. During the first three work sessions each student was instructed to stuff the envelopes as fast as he could (individual stuffing). During the second three work sessions each student was assigned a component of the task, and the group was instructed to stuff the envelopes as fast as they could (assembly line stuffing). These work arrangements were alternated every fourth session until each student had performed for nine fifteen minute sessions under each work arrangement.

Throughout the <u>individual stuffing</u> work sessions social reinforcement was frequently given. That is, the teacher intermittently dispensed such verbal statements as "good job," "You are doing fine," "That's good, but can you get even more than that?" "great job," and "excellent work." At the end of each session, the number of envelopes each student stuffed was written next to his name on the chalkboard. Each student was then praised and/or encouraged to do better the next time.

Exactly the same verbal comments were dispensed by the teacher during the assembly line stuffing sessions. However, feedback in the assembly line setting consisted of writing the total number of envelopes the group stuffed on the chalkboard and praising and encouraging the group to do better the next time.

Individual and assembly line production rates uder social and tangible reinforcement. At the end of session 18, students had worked for nine fifteen minute periods in both the individual and assembly line settings with teacher praise, encouragement and feedback. At session 19, the reinforcement conditions were changed. In addition to social rewards, students were given the opportunity to work toward acquiring a "banana split."

Individual production. Starting at session 19 a production goal was set for each student. Each student's goal was the highest number of envelopes he had stuffed during any one of the nine preceding individual work sessions. The students were instructed that each time they exceeded their particular goal they would be given a cardboard tag which they could later exchange for a part of a "banana split." It was explained that the first tag (a white one) represented a scoop of ice cream. Each additional tag (of varied colors) could be exchanged for one trimming from the selection of: bananas, chocolate sauce, caramel sauce, nuts, whipped cream, and cherries. Thus, each time a student exceeded his individual production goal, he was awarded a tag that could be exchanged for a component of a banana split.

Assembly line production. Similarly, for assembly line stuffing the group goal was the highest number of envelopes they had stuffed during any one of the nine preceding assembly line work sessions. The students were instructed that each time the group exceeded the goal, each one of them would be given a tag which could be exchanged for a component of the banana split.

Work conditions under the individual and group banana split contingency consisted of: three sessions of individual stuffing, three sessions of assembly line stuffing, two sessions of individual stuffing and finally two sessions of assembly line stuffing. While the students were working for the banana split, they were also receiving praise, encouragement and feedback from the teacher. At the end of each session envelopes were counted and the colored tags were taped on the chalkboard next to each individual's name.

RESULTS

The number of envelopes each of the six students stuffed in each session were combined, yielding a group total of envelopes stuffed per session. Each completed envelope was checked by a staff member to insure that an address was visible through the windowed envelope. Incorrectly stuffed envelopes were not included in the counting.

Insert Figure 1 about here

As can be discerned from Figure 1, the students consistently stuffed envelopes at a higher rate in the individual work setting than in the group work setting. During the first nine individual work sessions the students averaged 167 envelopes stuffed per 15 minute session. During the first nine assembly line work sessions the students averaged only 111 envelopes stuffed per 15 minute session.

When the "banana split" was introduced, the production rates of the students under individual and assembly line work sessions increased dramatically. During the sessions when the banana split contingency was in effect the students averaged 260 (60% increase) and 162 (49% increase) envelopes stuffed in the individual and assembly line work settings respectively.

DISCUSSION AND PRACTICAL IMPLICATIONS

This project was concerned with two major objectives. The first was to investigate the differential effects of individual and assembly line work settings on production rates. There can be little doubt that the students consistently produced at higher rates when in the individual work setting, regardless of the reinforcement procedures in effect. Parametric manipulations were not attempted and there may be many factors that might have contributed to the superiority of the individual work setting. For example, the assembly line may have been structured in such a way as to impede rather than facilitate combining the components of the task. That is, if the assembly line had been structured differently, increased production rates might have accrued. (It should be noted that intrinsic to an assembly line arrangement group production is, for the most part, a function of the least efficient member.)

The individual work setting seemed to provide for comparative and competitive interactions. Many times during the individual work sessions, the teacher observed the students comparing their completed piles to those of their peers. In addition, the scores posted beside each student's name at the end of each work session resulted in such statements as "I beat you this time" and "I'll get more than you next time." However, in the assembly line setting, there was only one pile of envelopes and only one score to place on the chalkboard. It is at least feasible that this work arrangement decreased interstudent comparisons and competition resulting in lower production rates.

Thus, while it is possible that the greater production in the individual work arrangement was merely an artifact of a poorly designed assembly line, it seems more probable that the individual work setting provided interstudent competition and feedback that were consequential in improving performance.

The second major objective was concerned with increasing production rates by manipulating consequences. It is assumed that during the first 18 work sessions, social reinforcement in the form of teacher praise and encouragement was sufficient to maintain a reasonably constant production level. However, performance after the introduction of the goal setting and banana split contingency demonstrated that the students initially were producing at a much lower rate than they were capable and that their behavior was sensitive to meaningful changes in their environment. Even though the students had to demonstrate only minimal (less than 1%) improvement to attain their goal, the banana split contingency resulted in 60% and 49% increases in the individual and assembly line work settings respectively.

Practical Implications

Perhaps the most important practical implication of this demonstration is that the teachers defined their instructional objectives in such a way that the behavioral components of these objectives could be directly measured (i.e. the number of envelopes stuffed during a specified time period). Such direct measurement enabled the teacher to generate two crucial instructional evaluations. First, she could determine whether or not her teaching techniques affected the behavior of the students in a desired manner. Second, if the desired changes in behavior were not discernible, the teacher could immediately make appropriate adjustments in her technique until she designed a procedure that proved effective.

An additional implication is that the demonstration was designed and implemented by classroom teachers in a public school with little increase in time or effort. This factor strongly suggests that basing an instructional procedure on direct measurement of student behavior is both practical and well within the capabilities of classroom teachers.

Finally, it is becoming increasingly evident that retarded students are responsive to changes in their work environment (Brown and Pearce, 1970; Huddle, 1967; Noonan and Barry, 1967; Zimmerman, Stuckey, Garlick and Miller, 1969) and that a particular level of functioning at one point in time is not necessarily representative of performance capabilities. Admittedly, the use of a "banana split" to improve performance is an artificial consequence not feasible in competitive employment. However, such similar operative consequences as money, praise, and tokens have proven effective in contributing to the development and maintenance of functional vocational behaviors. As our teaching technology improves our expectations of the level of vocational performance of retarded students must change. It is becoming increasingly difficult to justify basing vocational "training" programs on tasks that students are currently capable of performing. The responsibility is now placed on educational and workshop personnel to design and manipulate training environments that arechallenging to their students and workers and that will contribute to the maximum development of functional vocational repertoires.

References

Brown, L. and Pearce, E. A case study approach to increasing the production rates of trainable level retarded students in a public school simulated workshop. Education and Training of the Mentally Retarded, In press.

Crosson, J. E. A technique for programming sheltered workshop environments for training severely retarded workers. American Journal of Mental Deficiency, 1969, 73 (5), 814-818.

Huddle, D. D. Work performance of trainable adults influenced by competition, cooperation and monetary reward. American Journal of Mental Deficiency, 1967, 72 (2), 198-211.

Noonan, J. R. and Barry, J. R. Differential effects of incentives among the retarded. The Journal of Educational Research, 1967, 61 (3), 108-111.

Zimmerman, J., Stuckey, T. E., Garlick, B. J., and Miller, M. Effects of token reinforcement on productivity in multiply handicapped clients in a sheltered workshop. Rehabilitation Literature, 1969, 30 (2), 34-41.

Figure 1. Total number of envelopes stuffed per 15 minute sessions in individual and assembly line work arrangements under (I) social reinforcement only and (II) social and tangible reinforcement.

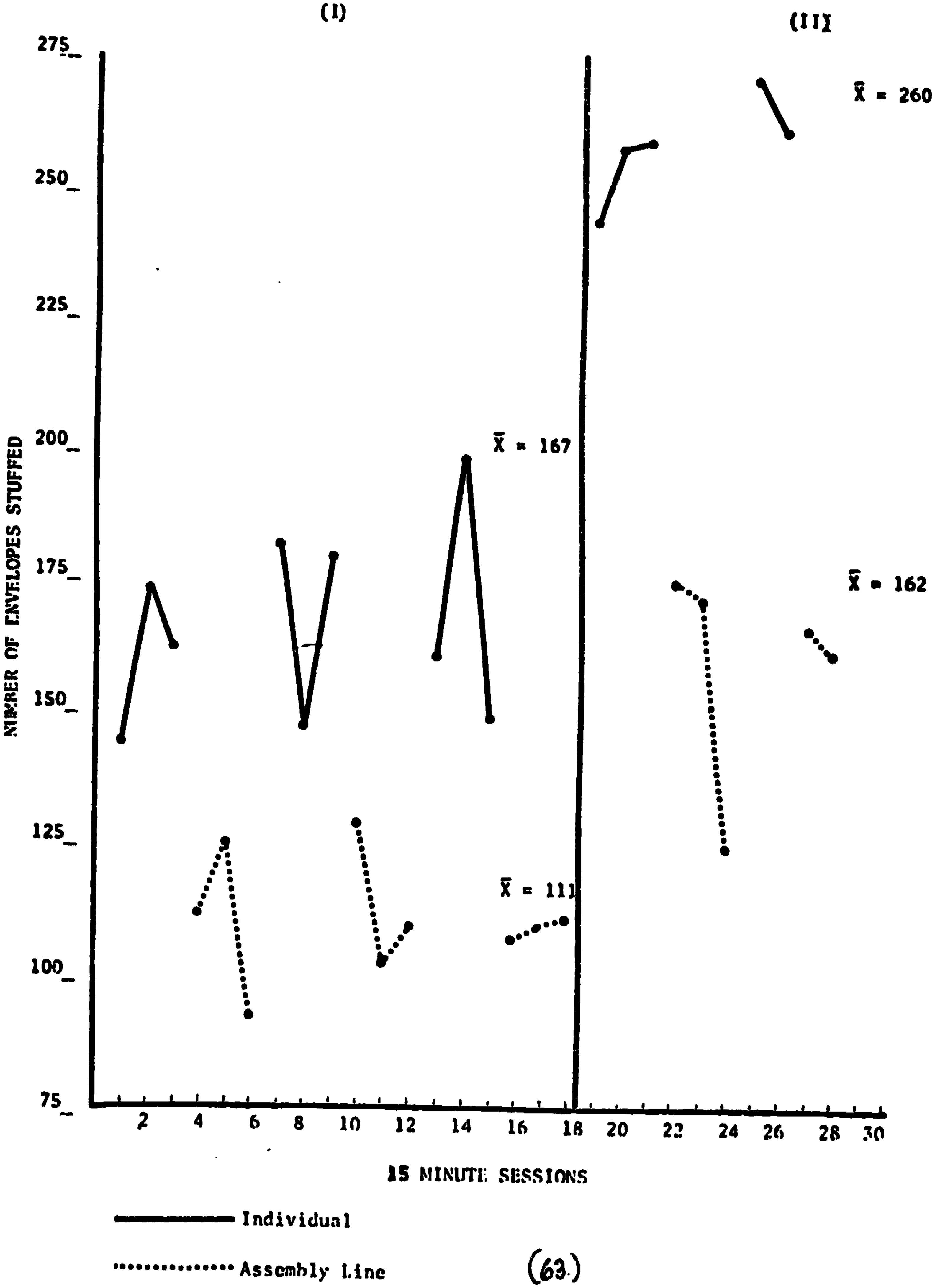
Lou Brown, Ph.D. Assistant Professor Department of Studies in Behavioral Disabilities, University of Wisconsin, Madison, Wisconsin. Educational Consultant, Madison Public Schools, Madison, Wisconsin.

Sylvester Johnson, Teacher, Madison Public Schools, Madison, Wisconsin.

Hope Klemme, Teacher, Madison Public Schools, Madison, Wisconsin.

Nancy Fenrick, Research Assistant, University of Wisconsin, Madison, Wisconsin.

Figure 1


(I)
(II)
275
250
225
200
175
150
125
100
75
NUMBER OF ENVELOPES STUFFED
X̄ = 260
X̄ = 167
X̄ = 162
X̄ = 111
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
15 MINUTE SESSIONS
Individual
Assembly Line

Increasing the Production Rates of Trainable Retarded Students in a Public School Simulated Workshop

Lou Brown and Eve Pearce

Education and Training of the Mentally Retarded

Abstract: Teacher praise and knowledge of results were used to increase the production rates of five emotionally disturbed students. When the emotionally disturbed students could perform the task consistently and efficiently, they were used as models for three trainable level retarded students. While the production rates of the three trainable level students improved, each student seemed to be affected differently by exposure to reinforced models, direct reinforcement, and knowledge of results.

If trainable level retarded persons can be expected to function vocationally in sheltered workshops (Cohen, 1966), the question arises as to what special education programs in public schools can do to facilitate future vocational adjustment. The writers feel that if a sheltered workshop environment is a probable placement for this level student, at least part of the public school curriculum should be designed to contribute to the development of basic vocational skills.

This paper is a report of how a teacher in a public school manipulated a simulated workshop environment in an attempt to improve the work skills of individuals diagnosed as trainable mentally retarded. The specific problem confronting the teacher was rate, i.e., the students seemed to be performing at a relatively low rate when compared to what might be expected in a sheltered workshop or competitive employment. Therefore, techniques that might be expected to increase the rate of production were employed (Bandura, 1969).

This study was divided into two parts. The first part was concerned with increasing the number of envelopes a group of five emotionally disturbed students filled in 20 minute work sessions. The second part was concerned with using five emotionally disturbed students as models in an attempt to affect the individual production rates of three trainable level retarded students.

Procedures Followed

Workers. The five students used in the first part of the study had received psychiatric diagnoses of mental illness (e.g. autistic, schizophrenic) and thus were enrolled in a special education class for emotionally disturbed children in a midwestern public school system. They ranged in chronological age from 12 years 9 months to 16 years 4 months. Their IQ scores ranged from 51 to 67.

The three workers added in the second part of the study were enrolled in a classroom for trainable level students. Joe was a 20 year old mongoloid with an IQ of 30; Marilyn, a 16 year old mongoloid with an IQ of 47; and Dick, 16 years old with an IQ of 48.

Work Setting. All work was performed in the school gym at lunch tables which could seat eight students comfortably. Each student had his own supply of materials and a small cardboard box. At the start of each session, a clock was placed in the middle of the table and set at 20 minutes. At the end of 20 minutes, a bell would sound and the session was terminated.

Task. The work task involved the following steps:

1. Placing the leaflet into an addressed folder.
2. Placing the leaflet and addressed folder into a windowed envelope so that the address could be read through the window of the envelope.
3. Tucking the flap into the envelope.
4. Putting the envelope into a box.

PART ONE

Program. The first part of the study was concerned primarily with increasing the number of envelopes the group of five emotionally disturbed students filled in 20 minute sessions.

After the teacher demonstrated how to perform the task successfully, each student was given a work station at the table and told to complete the task. When all students demonstrated they could complete the task the teacher said, "Now I want you to fill as many as you can. I am going to time how fast you are working and will let you know how well you are doing."

It was assumed that teacher proximity, verbal praise, and feedback of performance functioned as reinforcers. That is, when the five students were seated at their work station and performing the tasks, the teacher patted them on the back and made such statements as "Great job," "I am proud of you," "You are doing fine," or "I am pleased to see you working so well." In addition, when each 20 minute work session was completed, each child was told how many envelopes he had filled and advised how his performance compared with previous 20 minute sessions.

Results and discussion. At the end of each 20 minute session, the teacher compiled the number of envelopes each student filled and computed a group average. The average number of envelopes the group filled during 46 sessions is illustrated in Figure 1.

Inspection of Figure 1 indicates that the average number of envelopes filled increased over 20 minute sessions. That is, during the first five sessions the group filled an average of 47 envelopes per session. During the final five sessions the group filled an average of 86 envelopes per session. At this point, it cannot be determined whether this increase in performance was due to practice, verbal reinforcement, feedback, peer modeling, or some other variables not readily apparent. Nevertheless, their records indicated that the students could remain at their work stations and consistently and efficiently complete the task.

PART TWO

The second part of the study was concerned with using the five emotionally disturbed students as models in an attempt to delineate variables that might affect the production rates of three trainable level retarded students.

The trainable level students were studied individually, since the manipulations made were based on individual variations in production rates. Each child was investigated under the following three conditions.

1. Baseline. Each student was assigned a seat approximately 20 feet away from the table at which the models were working. After the teacher demonstrated how to perform the tasks and made sure that each student could complete the entire sequence, the students were instructed to put the leaflets and letters into the envelopes as fast as they could. They were then left alone for 20 minutes. At the end of 20 minutes, the teacher collected the individual piles of envelopes, removed them from view, and counted them.

2. Exposure to reinforced models. The three students were seated at the table at which the models (emotionally disturbed children) were working and instructed to work as fast as they could. While the trainable level students were exposed to this condition, they did not receive comments or feedback from the teacher concerning their performance. However, the models did receive approving comments from the teacher during these sessions. The models were also told how many envelopes they had filled when the sessions were completed.

3. Reinforced models plus direct reinforcement and feedback. The trainable level students were given the same encouragement, praise, and feedback as the models.

Joe

Program. The program that was developed for Joe involved the following five phases:

Phase one. Baseline.
Phase two. Exposure to reinforced models.
Phase three. Return to baseline.
Phase four. Re-exposure to reinforced models.
Phase five. Exposure to reinforced models plus direct reinforcement and feedback.

Results and discussion. During Phase One, Joe filled an average of 44.3 envelopes per session (Figure 2). During the second phase, he filled an average of 63.3 envelopes per session. The average may not be the best indicator of his performance during Phase Two, since inspection of Figure 2 suggests that he seemed to be performing better toward the end of Phase Two than at the start.

During Phase Three, when Joe was removed from view of the models, he filled an average of 55.8 envelopes per session. However, inspection of Figure 2 suggests that the more sessions he was away from the models, the fewer envelopes he filled.

When Joe was returned to the models at Phase Four, a rather marked increase in the number of envelopes filled was observed (Session 22). While this increase was not maintained over the succeeding three session, Joe did average 77.9 envelopes filled during Phase Four as opposed to 55.8 envelopes filled during Phase Three.

During Phase Five, Joe was given exactly the same treatment as the models. This change did not seem to have any appreciable effect on the number of envelopes he filled. That is, during phases 4 and 5, Joe filled an average of 77.7 and 79.7 envelopes per session respectively.

Dick

Program. The program designed for Dick included the following five phases:

Phase one. Baseline.
Phase two. Exposure to reinforced models.
Phase three. Return to baseline.
Phase four. Re-exposure to reinforced models.
Phase five. Exposure to reinforced models plus direct reinforcement and feedback.

Results and discussion. During Phase One Dick filled an average of 36 envelopes per 20 minute session (see Figure 3).

When Dick was placed at the table with the models (Phase Two) he filled an average of 58 envelopes per 20 minute session. Inspection of Figure 3 suggests that although the influence of the models had an initially positive effect on his performance, this influence seemed to diminish rapidly over time. It is also possible that the temporarily increased rate was due to the mere change in environmental conditions.

When Dick was removed from view of the models (Phase Three) his production rate decreased gradually at Session 8 and then returned to a level not appreciably different from his performance under the baseline condition (X = 31).

When Dick was returned to the models (Phase Four) only a slight increase was observed in the number of envelopes he filled per 20 minute period (X = 41). It also appeared that his performance was again decreasing over sessions.

When given reinforcement and feedback (Phase Five) Dick's performance seemed to increase sharply (X = 71) and remain at a relatively high rate.

Inspection of Figure 3 suggests that Dick's performance was, in some degree, a reflection of the modeling and direct reinforcement conditions provided.

Placing him in the presence of reinforced models seemed to result in an initial increase followed by a gradual reduction in the number of envelopes filled. The effects of direct reinforcement seemed to be more pronounced and durable in that when he was receiving direct reinforcement he performed at a higher rate than under baseline or modeling conditions. It appears that this higher rate of performance was maintained over time when compared to his performance under the model-only condition.

Marilyn

Program. The program designed for Marilyn was different from those of Joe and Dick in that it involved only the following three phases:

Phase one. Baseline.
Phase two. Exposure to reinforced models.
Phase three. Exposure to reinforced models plus direct reinforcement and feedback.

Results and discussion. During Phase One, Marilyn averaged 21 envelopes filled per 20 minute session (Figure 4). During Phase Two, she averaged 19 envelopes, and during Phase Three, when she remained at the table with the models and was given positive reinforcement and feedback, she averaged 41 envelopes filled per 20 minute period.

The performance record of Marilyn indicates that, unlike Joe and Dick, she did not appear affected by the mere presence of reinforced models. However, when she was given the same kind of reinforcement and feedback as the others at the table, her performance doubled. While her performance never did reach the level of the models, a substantial improvement over her baseline performance was observed.

Summary and Practical Implications

The primary objective of the study was to increase the production rates of the three trainable level students. There can be little doubt that their production rates did, in fact, increase. However, the problem of attributing the increase to specific environmental variables still remains. Therefore, the explanations offered should only be considered tentative.

In the first part of the study systematic manipulations were not attempted. Thus, the increase in production rate of the group may be explained by any number of variables, e.g., practice, feedback, teacher proximity, verbal reinforcement, peer pressure, peer models, a combination of all the above, or other variables not readily apparent. In addition, the problem arises that what accounts for the increase in one student's performance may have little or no effect on the rate of another. Obviously, these problems can be answered only by future research involving stringent parametric manipulations.

In the second part of the study systematic manipulations were attempted and the effects of these manipulations were assessed on an individual rather than group basis. As can be expected, the patterns of performance were unique to the individuals under study. For example, all three students were exposed to reinforced models and three different performance patterns seemed to emerge: (a) the performance of Marilyn did not seem to be affected at all by exposure to reinforced models, (b) the performance of Joe seemed to increase and remain at a higher level, and (c) the performance of Dick indicated that the modeling effects, if any, were temporary in that both times he was exposed to the models an initial increase was followed by a gradual decrease.

A similar situation seemed to exist when the three students were given direct reinforcement by the teacher. Joe seemed to perform as well under the direct reinforcement and feedback condition as he did under the modeling condition. Dick and Marilyn seemed quite sensitive to direct reinforcement and feedback in that their performance increased markedly and was apparently maintained when direct reinforcement and feedback were applied.

If we view students or trainees in workshops as individuals; it seems only logical that we attempt to generate a training environment that fosters individual development.

In order to approximate this ideal we need at least two things: (a) a way of measuring some of the components of individual development, and (b) a variety of procedures that might contribute to individual improvement.

The present study represents an attempt to use the single subject design (Sidman, 1960) as a method of evaluating individual progress. That is, the training programs were based on the performance records of the individual students. An analysis of their records indicated that each student seemed to work at different rates and for different reasons. The point to be made here is that if we keep individual performance records, we stand a better chance of tailoring individual programs.

The use of competent models, contingent reinforcement, and feedback are but a few of the techniques known to improve performance (Bandura, 1969; Jens & Shores, 1969). Money, tokens, edibles and other tangibles have also proved effective (Huddle, 1967; Noonan & Barry, 1967; Zimmerman, Stuckey, Garlick, & Miller, 1969). If teachers or sheltered workshop personnel are confronted with the problem of low production rates, they might consider systematically manipulating several of the performance variables that seemed to be successful with these students.

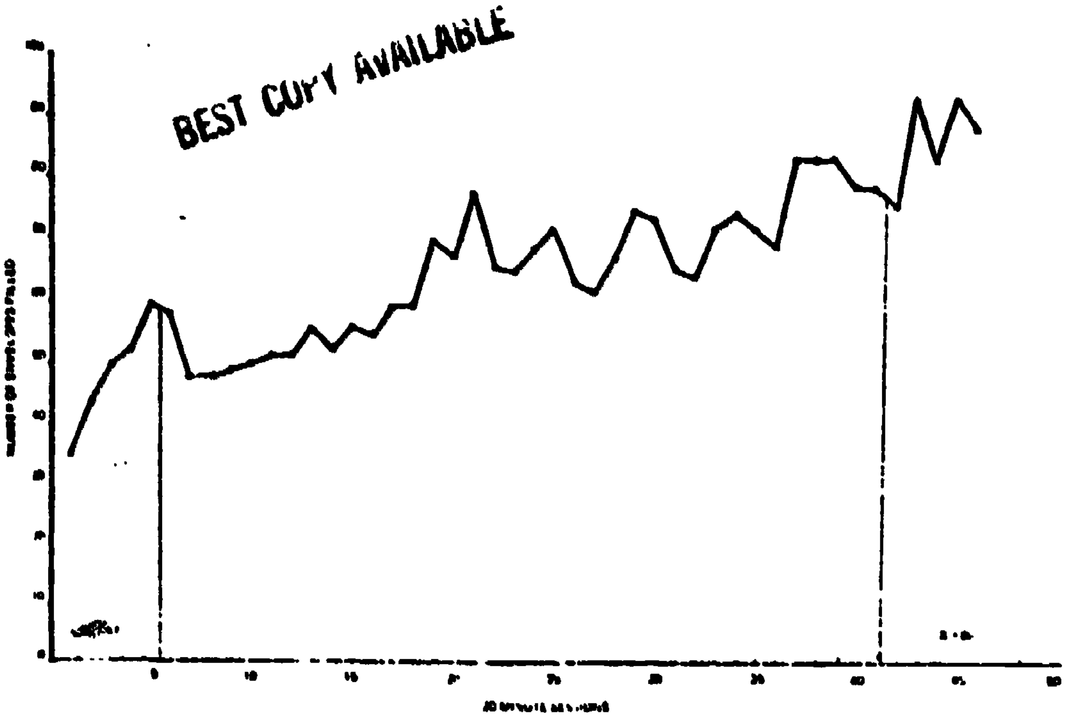


FIGURE 1. Average Number of Env lopes Filled by Emotionally Distu-bed Children

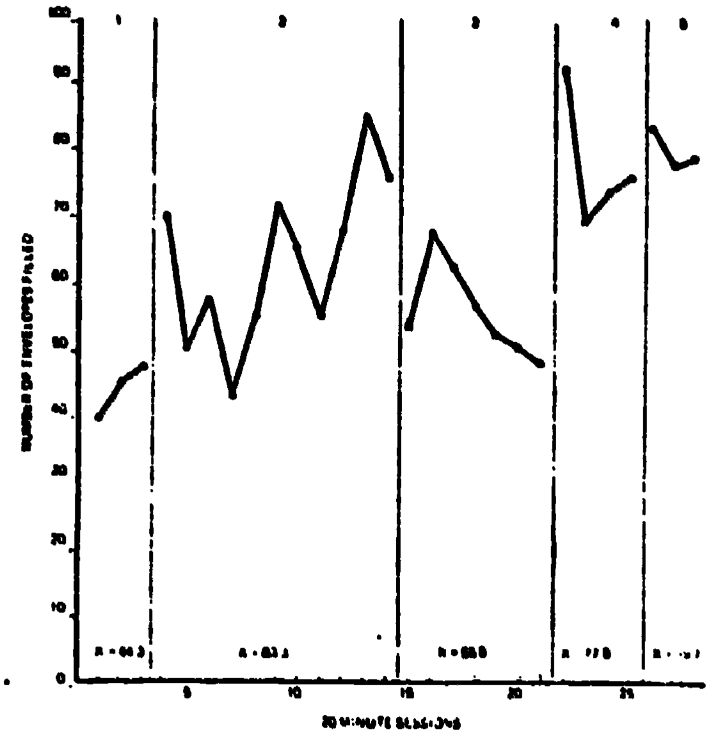
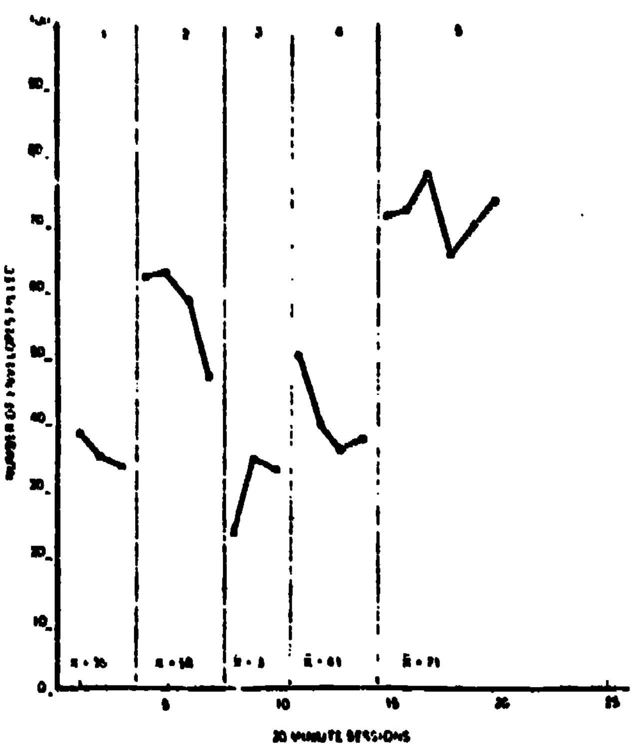


FIGURE 2. Total Number of Envelopes Filled by Joe in Each of Five Ph:



;URE 3. Total Number of Envelopes Filled by Dick in Each of Five Phases

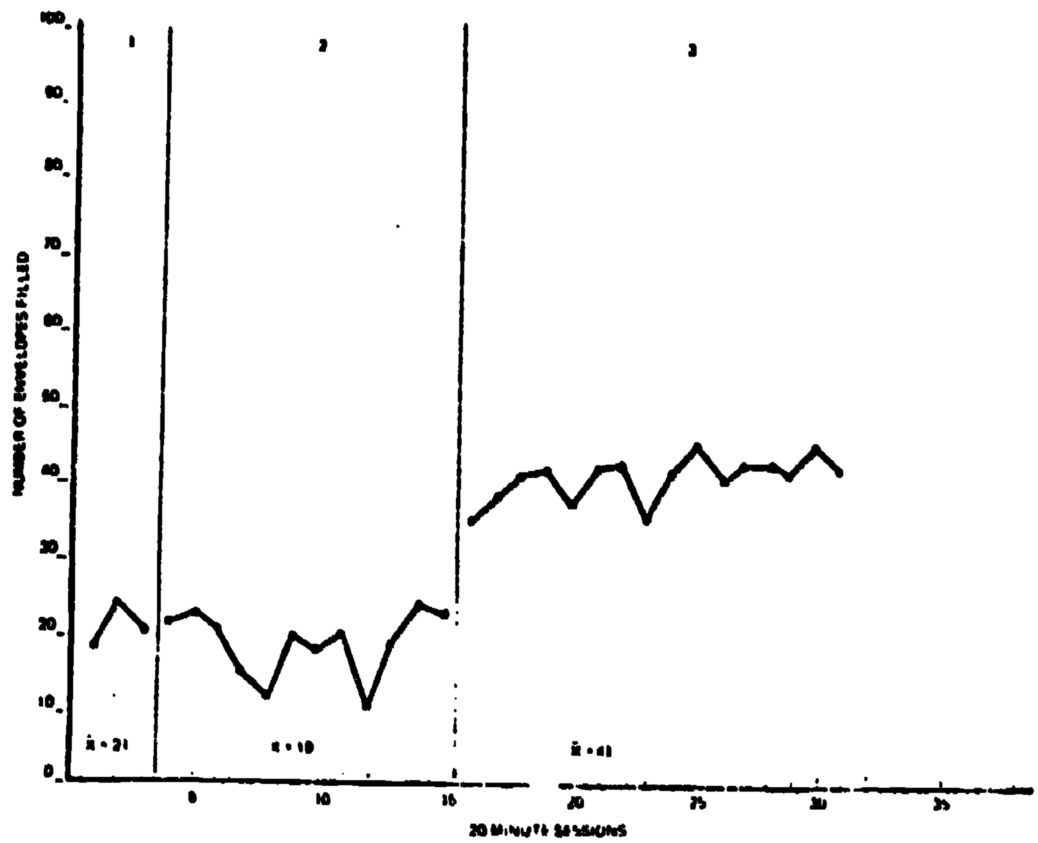


FIGURE 4. Total Numbe: of Envelopes F..'ed by Marilyn in Each of Three Phases

Effects of Consequences on Production Rates of Trainable

Retarded and Severely Emotionally Disturbed Students

in a Public School Workshop.[1]

Lou Brown, Patricia Van Deventer and Lucille Perlmutter

University of Wisconsin and Madison Public Schools

Most public school prevocational training programs involving exceptional children have been concerned with educable retarded and mildly emotionally disturbed students. There are at least two major reasons why few public school prevocational training programs have been developed for trainable retarded and severely disturbed students: First, many trainable and severely disturbed students have been either insitutionalized or excluded from school programs. Second, it has often been assumed that these students are either intellectually, socially or emotionally incapable of benefiting from long range vocational skill development programs.

Recently, there has been a rather marked increase in public school programs for trainable and severely emotionally disturbed students and a concomitant decrease in the availability of institutional placements. Thus, it seems logical that many of these students upon completion of public school will be expected to function in their communities. Obviously, vocational skills are among the most important prerequisites for successful or even quasi-successful performance in the community.

Gold (1968) stated that "Some tasks require a high degree of intelligence but little formal training. Others require trained ability, but a minimum of intelligence. And some require both." While Gold and his associates (1969) have been remarkably successful in developing relatively complex vocational skills in trainable students, there still seem to be many vocational tasks available in the work community that require little intelligence and little training; e.g., collating, envelope filling, color coding, various sorting tasks, and assembling a wide variety of units involving a small number of components.

The work task involved in this project (collating four page catalogues) is one that seems to require little intelligence and little training. In tasks of this sort, the problem is not so much to teach the student to perform the task correctly, but to teach him to perform at a rate sufficient for the employer and employee to realize an acceptable return form their respective investments.

[1]This demonstration was supported in part by NICHD Grant 5 P01 HD 03352 to the University of Wisconsin Center on Mental Retardation.

To teach a student to acquire the behaviors necessary for successful completion of a task, the teacher typically relies upon learning procedures such as graduated modeling, fading, priming, response differentiation and many of the procedures used in discrimination training (Gold and Scott, In Press). Once a student can perform a task successfully, the rate at which he performs then becomes the instructional problem. Perhaps, the most efficient method of increasing performance rates is to present meaningful consequences contingent upon performing at higher rates.

Apparently many sheltered workshops stratify their workers on the basis of production rates. That is, a competitive production range for a particular task is established. If a worker is not performing within the competitive range, he may be suitable for what is sometimes called competitive sheltered work. That is, although he cannot produce as much as a worker in competitive employment, the workshop can still realize a profit from his production rate. If a worker is not performing within the competitive sheltered workshop range, he is typically stratified into what is sometimes called an activity center range.

This paper is a demonstration of how the manipulation of response consequences can increase the production rates of trainable retarded and severely emotionally disturbed students in a public school prevocational training program on a collating task. Since the behavioral demands of the task were simple, the objective of the project was to teach each student to perform in the competitive production range.

Method

Students (Ss)

Eighteen Ss (8 males and 10 females) enrolled in four different public school special education classes for retarded and emotionally disturbed students were randomly selected. Ss ranged in CA from 12 to 20 years ($\bar{X}$=16.6), in MA from 5 to 14 years ($\bar{X}$=7.7), in IQ from 31 to 70 ($\bar{X}$=46.7) and in years in school from 6 to 13 ($\bar{X}$=10.6).

Educational, medical, psychological, and psychiatric records included such diagnoses as trainable retarded, low educable retarded, psychotic, emotionally disturbed, epileptic, brain injured, expressive aphasic, chronic brain syndrome and Downs Syndrome. These records also contained such statements as "lazy, apathetic and unmotivated," "no attention span," "no eye-hand coordination," "weakest in fine motor skills," "can't follow directions," "difficulty in controlling her hands," and "can barely hold a pencil."

Materials and Work Arrangement

Four different collators were used: a nine well wooden collator was obtained from a local workshop; the school custodian constructed a four-well wooden collator; and 2 collators were made of cardboard library boxes by the teacher aide. The four collators were placed on 2 tables and Ss were rotated so that each S worked at a different collator on consecutive trials. Four different colors (green, yellow, pink, white) of $8\frac{1}{2}$" x 11" paper were used. The different kinds of paper were actually job application forms. The bottom well of each collator contained 100 pieces of green paper, the next highest wells contained 100 pieces of yellow, pink and white paper respectively.

Data sheets, instructions, and graphs were constructed for each S. A kitchen timer was used to measure work intervals and nickels were used as reinforcers in the final phase of the program.

Teaching the components of the task:

The collating task was divided into the following components:

1) S takes 1 sheet of green paper from the bottom well with his right hand (if he is right-handed) and places it in the palm of his left hand.

2) S takes 1 sheet of yellow paper from the next highest well and places it on top of the green paper in the palm of his left hand.

3) S takes 1 sheet of pink paper from the next highest well and places it on top of the green and yellow papers in the palm of his left hand.

4) S takes 1 sheet of white paper from the next highest well and places it on top of the green, yellow and pink pieces of paper in the palm of his left hand.

5) S places the lower side of the papers on the table; put his hand on the sides of the papers so only the white sheet is visible.

6) S places the collated sheets on the table.

7) S collates four additional sheets and places the second set across the first batch (cross-hatch).

the catalogues completed by the Ss did not meet the exact specifications set by the teacher, the catalogue was not acceptable. It should be noted that a student could make more than one error on any one catalogue; e.g., the papers were turned the wrong way, more than four papers were in one catalogue, or the four colors were not in correct serial order.

In the first step of the teaching procedure T brought S to a collator and said, "You are going to learn to do this job. Now, please stand in front of this collator and do exactly as I tell you to do." T then said, "Take the sheet of green paper out of the bottom well with your right hand and put it in the palm of your left hand." If S responded correctly T said, "Good" and proceeded to component 2. If S did not respond correctly, T repeated the direction while she modeled the correct behaviors and then repeated the direction. Sixteen Ss responded correctly after the correct behaviors were modeled.

A priming procedure was used with the 2 Ss who did not respond correctly after the behaviors were modeled. That is, while repeating the directions T physically guided the 2 Ss through the correct behaviors. T then gradually removed her assistance until the 2 Ss could complete the entire series by themselves.

These procedures were followed until each S performed each component of the task in the correct serial order on three consecutive trials without verbal direction, modeling, or priming. That is, T said, "Start collating" and all Ss responded correctly.

Increasing Production Rates

When Ss demonstrated that they could perform the components of the task in the correct order, attempts were made to increase production rates. This part of the program was divided into the following 5 phases: baseline, charting, baseline, charting, and money.

Phase I (baseline). All baselines were obtained individually; that is, T brought S to the collator and T said, "I am going to time you to see how many catalogues you can make in a 10 min. period. When I say "Go," you are to start and when I say "Stop," you are to finish the catalogue you are working on. "Ready, Go." When S started to collate T left the immediate work area. At the end of the 10 min. period T returned, removed S from view of the collator, counted and recorded the number of correct and incorrect catalogues he completed and then selected a different S. Typically a 3 trial baseline period was used; however the variability of one S required a fourth baseline trial.

Phase II (charting). After baseline rates were established, four students were told to stand in front of the four loaded collators. T then presented each S with a graph of his baseline production rates and said, "This line tells me how many catalogues you collated in a 10 min. period. Now we will try to work better and faster. If you work better and faster, your line will go up and that is good. If you do not work better and faster, your line will go down and that is not good. Now, when I say "Go," I want you to work as fast as you can. When the 10 min. period is up, we will count how many you did, mark your graph, and see how far your line went up." Each S was given exactly the same directions and continued in this phase until his performance stabilize

Phase III (baseline). The procedures used in phase I were reinstated.

Phase IV (charting). The procedures used in phase II were reinstated.

Phase V (charting and money). In addition to obtaining feedback from their charts, money was used as an additional consequence. Money was introduce in the following manner. T pointed to the highest point on the graph recorded for each S and said, "This is the best you have produced so far in a 10 min. period. From now on each time you produce more than you ever did before you will be paid a nickel."

Results

Competitive employment norms for this particular task were not avaialble, so 4 teachers were brought to the workshop and asked to collate as many catalogues as they could in a 10 min. period. The rates per 10 min. period of the 4 teachers ranged from 65-75. According to the director of a local sheltered workshop, 70% of the competitive production range is considered sufficient to meet the criterion of competitive sheltered work and 10% of the competitive production range is considered an acceptable criterion for persons placed in activity centers.

An S was considered capable of competitive employment if he averaged at least 65-75 correctly completed catalogues in the final five 10 min. trials in which the money contingency was in effect. If an S averaged at least 46 catalogues during the final 5 trials, he was considered capable of competitive sheltered work; and if an S averaged more than 8 catalogues during these trials, he was considered placeable in an activity center. Based on these criteria, 3 Ss' production rates reached those expected in competitive employment; 6 reached production rates in the competitive sheltered work range; and 9 Ss remained in the activity center range.

While the performance records of each S were unique, several consistent production patterns were discerned. Thus, the performance patterns of the 6 Ss who are considered representative of Ss who performed at the three different production levels during the final 5 sessions will be presented here (See Figure 1).

During Phase I (baseline period) the production rates of all Ss were within the activity center range. (Average baseline production rates ranged from 0 to 39.6.) In addition to the relatively low production rates during this period, 7 Ss, including S_{16}, demonstrated a relatively high rate of errors (Average baseline error rates ranged from .3 to 20.).

During Phase II (charting) the production rates of all 18 Ss increased. However, the amount of increase varied widely between Ss. For example, only a slight rate increase was observed for S_{12}, but S_1 showed a rate increase of 50% when charts were introduced (See Figure 1). In addition to the increase in rates, the number of errors decreased in all 7 Ss who made the relatively high rates of errors in Phase I. (During this phase the average production rate ranged from 3.2 to 59, and the average error rate ranged from 0 to 7.2).

When charts were removed (Phase III) three different performance patterns seemed to emerge: Five Ss, including S_7 (See Figure 1), returned to their baseline levels of production; the rates of 7 Ss, including S_1, continued to increase, and the rates of 6 Ss, including S_4, did not change. During this phase errors either increased or remained the same in 6 Ss, but errors were virtually eliminated in the remaining 12 Ss.

During Phase IV when charts were reintroduced, the rates of 11 Ss, including Ss 1, 3 [illegible] & 16 increased; 5 Ss including S_{12} showed little change; and 2 Ss, not represented in Figure 1, decreased slightly in production from Phase [illegible]. In addition, errors were made by only 5 of the 18 Ss.

When money was introduced (Phase V) two response patterns emerged: 1) the rates of 14 of the 18 Ss increased (including Ss 1,3,4,7, & 16); and 2) by the end of Phase V errors were virtually eliminated in all Ss. During the final 5 trials of Phase V, 3 Ss averaged within the competitive production range. Although 3 additional Ss did reach competitive production levels in certain trials, their averages were below the competitive range. In addition, 3 of the 9 Ss whose average rate in the final 5 trials qualified only for activity center placement did perform at the competitive sheltered work range in certain trials. Finally, the 5 lowest production rates during the final 5 sessions ranged from 10.4 to 31 ($\bar{X}$=22). Five of these 6 Ss performed considerably above the minimum activity center range.

A Spearman rank order correlation coefficient was computed to determine whether IQ scores were independent of average production rates during the final five trials of Phase V. The correlation coefficient obtained (r_s = .38) was not statistically significant at the .05 level.

Discussion

When charts were introduced as a vehicle for providing each student with knowledge of how well he was producing, the rate of each student increased. In an attempt to discern whether the increases were due to charts, the charts were removed. If the increases were due solely to charts it would be expected that upon removal, production rates would have returned to baseline levels; but only five students returned to baseline levels when charts were removed.

There are at least two explanations why 13 students did not return to baseline production levels. First, it might be argued that charts were not functionally related to response rate, and the increases observed in Phase II were due to changes in the environmental arrangement, practice, or some other stimulus complex not readily discernible. Second, it might be argued that charts were responsible for the initial increases, but when they were removed other factors were present that either maintained or increased rates (Baer & Wolf, 1970). It appeared to the writers that some form of peer competition developed that might have attenuated the effects of charts on some students. For example, when charts were removed (Phase III) the teacher recorded such interstudent statements as "I'll beat you" and "My pile is bigger."

While these questions are important and can be answered by future empirical manipulations, they were peripheral to the primary objective of the project. Thus, charts were reintroduced and subsequently money was provided as a consequence for rate increases. The rates of 11 students increased when charts were reintroduced, and the rates of 14 students increased when money was made contingent upon rate increases.

Theoretically, the collating task was sufficiently simple that all students should have attained production rates acceptable for competitive employment. However, even though the rates of 16 of the 18 students did increase, only 3 met competitive production criteria. Obviously, the issue that must be confronted at this point is why only three reached the competitive production level.

One hypothesis might be that all students did not reach competitive production levels because of their inherent incapabilities. Whatever tenability this hypothesis may have, it does not provide impetus for the future development of public school prevocational training programs for these kinds of students. In fact, it is possible that acceptance of this hypothesis might interfere with the development of such programs.

A more potentially productive hypothesis might be that the arrangement of the workshop environment was not conducive to the development and maintenace of maximal production rates. For example, the manner in which the task was arranged may have imposed limits on the rates of some students. This hypothesis could be tested easily by presenting different task arrangements or introducing prosthetic devices (e.g., rubber thimbles) and measuring changes in rates.

It is also possible that the arranged incentives employed here (social praise, charts, money) may not have been sufficiently powerful to exact maximal performance. An increase in the amount of money offered, or the contingent presentation of other consequences under different schedules might have resulted in higher rates.

Another function of incentives may be to reduce error rate. Apparently, the students became more accurate when charts and money were introduced.

The absence of a statistically significant correlation between IQ scores and average performance rates is encouraging. For too long it has been assumed that low IQ scores correlate with low levels of general functioning. Perhaps it is time that the professional community delineate more relevant variables that are related to vocational efficiency (Chaffin, 1969).

Practical Implications

Perhaps the most salient practical implication is that the rate at which a student is currently performing may not represent the rate he is capable of achieving in a more reinforcing environment. Trainable retarded and severely emotionally disturbed students have historically been placed in nonreinforcing environments; e.g., institutions and community facilities with low performance expectations. Nonreinforcing environments have limited the behavioral repertoire of these students in at least two ways: They have tolerated the performance of simple tasks at low rates; and they have reduced the probability of exposure to training that would allow successful and efficient performance on tasks that are quite complex but nevertheless within their capabilities (Gold, 1969).

A second implication is that public school prevocational training programs are potentially capable of providing retarded and severely emotionally disturbed students with developmentally sound and relevant training. Not only can public schools make significant contributions toward the development of vocational skills, but they can also provide other agencies with detailed vocational placement information. For example, specific production rates on a number of simulated or real workshop tasks might be more relevant to a vocational rehabilitation counselor than an IQ score or a subjective clinical impression of "work adjustment" (Greenstein & Fangman, 1969).

A third practical implication relates to the use of money. In our society money may be considered a generalized reinforcer. That is, money is used to satisfy many different needs. Most, if not all, of our vocational environments use money as a consequence for appropriate work behavior. When a person is hired for a job it is assumed by the employer that money is one of the prime reasons the employee agrees to expend his time and energy. Unfortunately most trainable retarded and severely emotionally disturbed students are not allowed the extensive experience in the use and management of money afforded other persons in our society. Therefore, these students, as young adults, are at a distinct disadvantage in a work environment. Foremen or managers in vocational settings may not have the time or may not be so inclined to put individual production charts on a wall in the plant or pat workers on the back and say "Good job". Those responsible for the training of these students must find ways to teach the efficient use of money.

Limitations

Finally, it should be noted that generalizing from performance in 10 min. time samples in an artificial setting to 8 hr. work days in a community vocational facility is extremely hazardous. In addition, an acceptable production rate is only one of the many complex behaviors necessary for successful vocational functioning. An employee must also be able to relate successfully to work peers, develop adaptive leisure skills, and maintain personal health to name only a few.

References

Baer, D. and Wolf, M. M. The entry into natural communities of reinforcement. In Baer, D., Wolf, M. M. and Risley, T. An Experimental Analysis of Social Motivation. Academic Press Inc. (In Press)

Chaffin, J. D., Spellman, D. R., Regan, E. and Davison, R. Two Follow-Up Studies of Former Educable Mentally Retarded Students from the Kansas Work-Study Project, Univ. of Kansas, 1969.

Gold, M. W. Preworkshop Skills for the Trainable: A Sequential Technique, Education and Training of the Mentally Retarded, 1968, 3, 31-39.

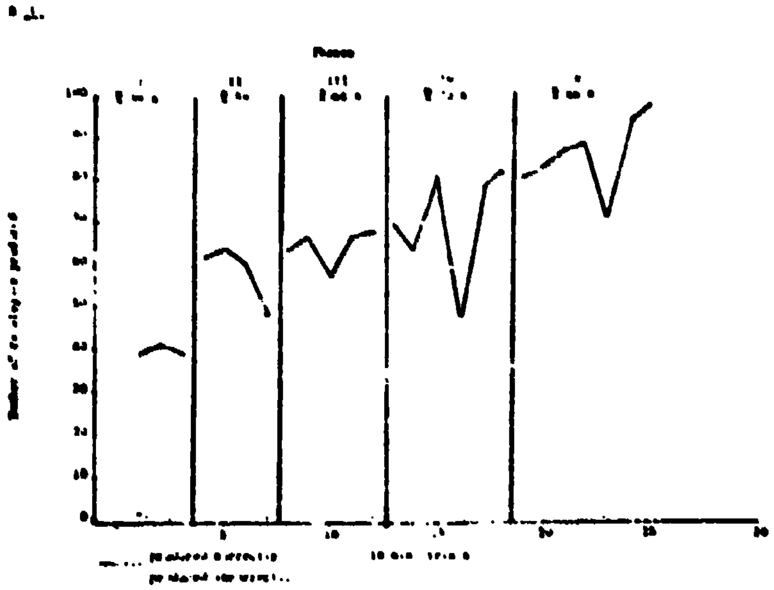
Gold, M. W. Acquisition of a Complex Assembly Task by Retarded Adolescents, Final Report Project #8-8060, U.S. Office of Education, May, 1969.

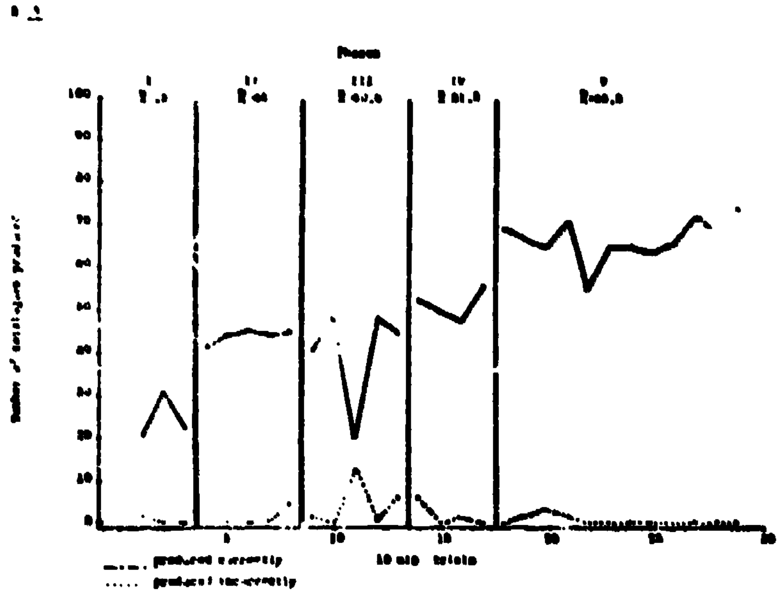
Gold, M. W., and Scott, K. G. "Discrimination Learning", Training the Developmentally Young, New York, John Day Company (In Press).

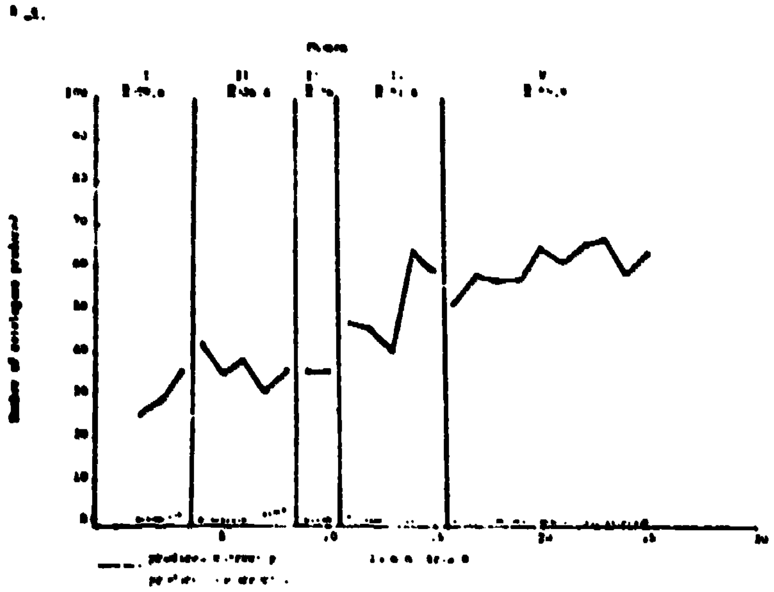
Greenstein, M. and Fangman, T. J. Vocational training for the mentally retarded in a metropolitan setting. Focus on Exceptional Children, 1969, 1(5), 1-6.

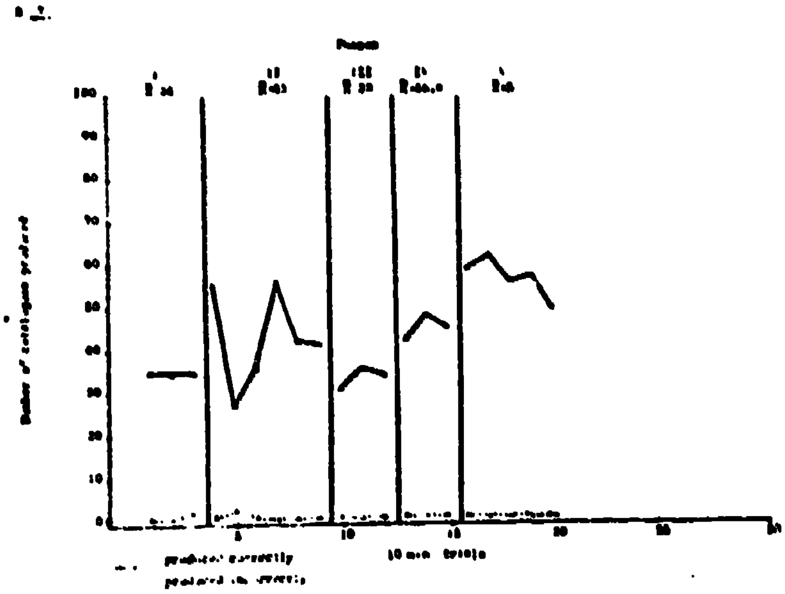
Figure 1 - Number of catalogues collated in ten min. time periods under five different conditions: I) baseline II) charts III) baseline IV) charts V) money

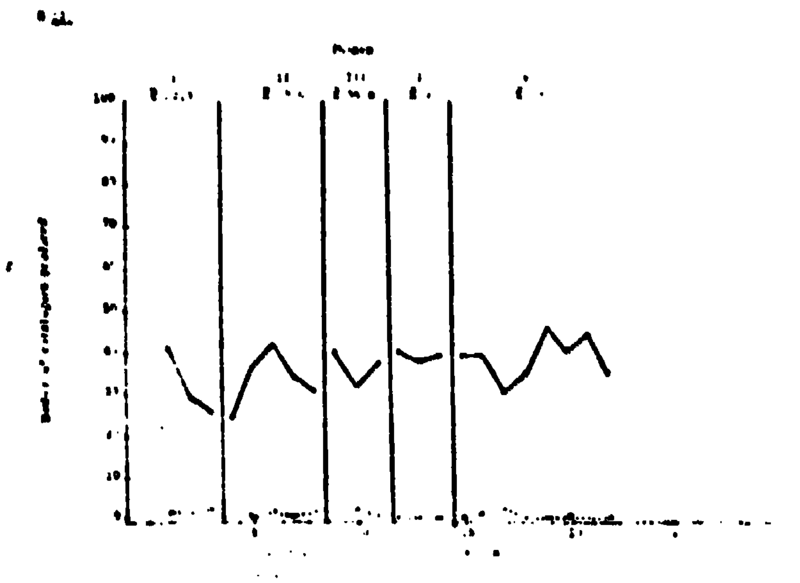
BEST COPY AVAILABLE

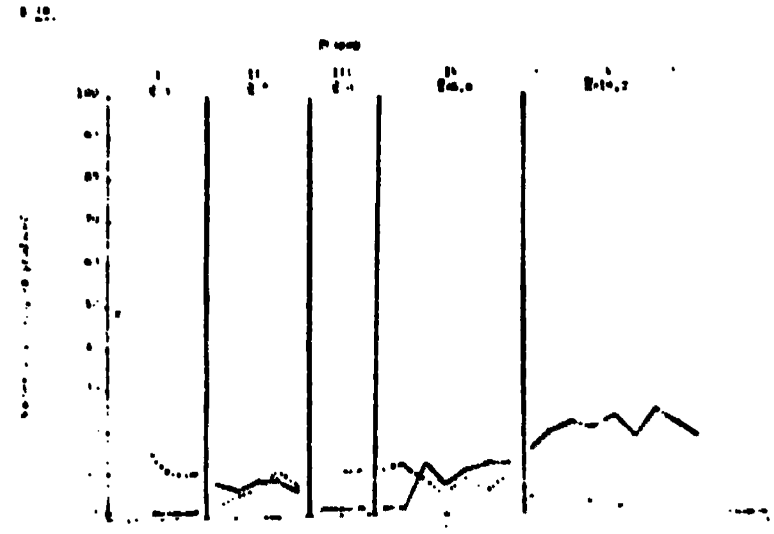












The Development of Quality, Quantity, and Durability in the Work Performance of Retarded Students in a Public School Prevocational Workshop[1]

Lou Brown, Tom Bellamy, Lucille Perlmutter,
Paula Sackowitz and Edward Sontag

University of Wisconsin and Madison Public Schools

Gainful community employment of retarded and severely emotionally disturbed individuals is often impeded by, among other things, incomplete or inaccurate performance on a work task, insufficient production rates, inappropriate social behaviors, inadequate work attendance, and unacceptable variability in work performance over time. Currently available evidence suggests that these impediments may be more closely related to training inadequacies and to the arrangement of events in the work environment than to deficits in the individuals (Ayllon and Azrin, 1965; Brown, Johnson, Gadberry and Fenrick, 1971; Brown and Pearce, 1970; Brown, VanDeventer and Perlmutter, 1971; Burchard, 1967; Crosson, 1969; Evans and Spradlin, 1966; Greene and Hoats, 1969; Huddle, 1967; Hunt and Zimmerman, 1969; Kahn and Burdet, 1967; Pavin, 1967; Zimmerman, Overpeck, Eisenberg and Garlick, 1969; Zimmerman, Stuckey, Garlick and Miller, 1969). The general approach of the above investigations has been to define behaviors which are desired in a work setting (attendance, appropriate social behavior, quality and quantity of work) and to measure the effects of specifically programmed environmental events on the occurrence of these behaviors.

The demonstration reported here was concerned with maximizing three important work attributes: the accurate completion of a work task (Quality); the accurate completion of the work task at competitive rates (Quantity); and the accurate completion of the work task at competitive rates under a typical vocational payment schedule (Durability).

Several well delineated instructional techniques (verbal directions, modeling and response priming) were systematically utilized to teach retarded adolescents to assemble packs of index cards accurately. Then sample rates were obtained from several non-retarded persons (school teachers). The rates at which the teachers produced were accepted as an operational definition of a competitive production range as competitive norms for this task were unavailable. Two basic rate building procedures (contingent reinforcement and reinforcement of increasingly higher rates) were then utilized in an attempt to teach them to perform the task at a rate within the competitive production range. Contingent reinforcement consisted of providing monetary payment for each pack of index cards produced accurately. Reinforcement of increasingly higher rates consisted of providing monetary payment for each pack of cards produced accurately, but only if more packs were produced in a given time period than were produced in similar periods in the past.

---

[1]This demonstration was supported in part by funds from the Wisconsin State Department of Vocational Education, in part by Wisconsin Alumni Research Foundation and in part by NICHD Grant 5 P01 HD 03352-02 to the University of Wisconsin Center on Mental Retardation.

Perhaps the most efficient method of maintaining durability of responding is to develop some form of variable-ratio schedule control (Gardner, 1971). However, there are probably few, if any, community workshop programs that are arranged to meet the criteria of a variable-ratio schedule. Most community work settings involving repetitive tasks provide payment for work performed at scheduled intervals (weekly or biweekly).

The community sheltered workshop in which these students were ultimately expected to perform provides piece-rate payment on a weekly schedule. That is, each worker is paid weekly for his actual production. The primary objective of this demonstration was to maintain quality and quantity of performance under this payment schedule.

While the rate building procedures were in effect the students received payment for their work at the end of each work session. When the rates of a student reached the competitive employment range or seemed to reach a plateau, the reinforcement schedule was attenuated. That is, instead of receiving payment at the end of a work session, payment was dispensed at the end of the work day. If rates did not decrease and if quality remained acceptable, payment was then dispensed at the end of a 5 work day week. Much existing evidence supports the assumption that the maintenance of high response rates over time can be accomplished when originally immediate reinforcement is dispensed after increasingly larger units of work or time (Ferster and Skinner, 1957).

The entire demonstration consisted of the following 7 Phases: Phase I, teaching the work task; Phase II, baseline; Phase III, weekly payment; Phave IV, session payment; Phase V, session payment plus high rate contingency; Phase VI, daily payment; Phase VII, weekly payment.

METHOD

Subjects (Ss)

$\underline{S}_1$ was 14 yrs. 5 mos. of age and had been enrolled in public school programs for 9 years. Psychological reports indicated that on the WISC he had obtained a Verbal IQ score of 76, a Performance IQ score of 86, and a Full Scale IQ score of 79. Statements such as "tests in the borderline level but functions in the trainable level," and "seems unable to attend to a task and practically accomplishing nothing" were contained in his cumulative folder.

$\underline{S}_2$ was 18 yrs. 4 mos. of age and had been enrolled in public school programs for 12 years. Psychological reports indicated that on the WISC he had obtained a Verbal IQ score of 61, a Performance IQ score of 86 and a Full Scale IQ score of 70. Statements such as "lacks motivation", "lacks confidence", "fear of failure prevents him from trying new activities", and "becomes anxious when called upon to demonstrate even simple skills," were contained in his cumulative folder.

S_3 was 16 yrs. 8 mos. of age and had been enrolled in public school and state hospital educational programs for 11 years. On several occasions an intellectual evaluation was attempted but S_3 refused to participate. Statements such as, "childhood psychosis", "emotionally disturbed", "does not communicate with people unless threatened with loss of recess or lunch", and "positive reinforcement does not work unless coupled with something negative", were contained in his cumulative folder.

S_4 was 14 yrs. 4 mos. of age and had been enrolled in public school programs for 4 years and in a state hospital for 4 years. Psychological reports indicated that on the WISC he had obtained a Verbal IQ score of 61, a Performance IQ score of 57 and a Full Scale IQ score of 56. Statements such as "emotionally disturbed", "severe behavioral and learning disabilities", "possible mild perinatal brain injury" and "lacks eye-hand coordination" were contained in his cumulative folder.

Materials

Each S was seated at a table in the school workshop facing the following materials:

1) Four 12-pack stacks of 50 white 3" X 5" index cards. Each pack of 50 cards was separated by a 3" X 5" green index card.

2) An 8" X 5" X 3" wooden jig, taped to the table immediately in front of S. The center third (3 1/8") of the jig was recessed 3/4", and black lines were drawn across the jig from left to right as placement guides for the wrapping strips.

3) 8" X 4" light-weight white paper, used to wrap 50 cards into packs.

4) A cellophane tape dispenser containing a roll of 5/8" tape.

5) A cardboard box for placement of completed packs.

A schematic arrangement of the work task is presented below. In addition, a kitchen timer and two data sheets were used. One data sheet allowed for the recording of correct and incorrect responses made to each of the 15 components of the task during the teaching phase. The other data sheet was used during phases II through VI, and allowed for the continuous recording of the number of accurate and inaccurate packs produced in a given trial.

The entire program was conducted in a public school prevocational workshop and was supervised by a classroom teacher, two practice teachers, and a research assistant.

The work task

The work task was divided into 15 steps, each of which is represented below by the verbal directions used in teaching:

1. With your left hand, remove the green card from this stack and place it on the table here.
2. Pick up the pack of 50 white cards but do not pick up the green card.
3. Hold the pack of cards with your left hand.
4. With your right hand, take one strip of wrapping paper from this pile and place it between the black lines on the jig.
5. Place the pack of cards in the middle of the wrapping paper.
6. Press down on the pack of cards.
7. With your right hand, fold the right flap down on the pack of cards.
8. With your left hand, fold the left flap over the right flap.
9. Check to see if the edges of the wrapping paper are even. If not, even them out.
10. With your left hand, hold the wrapping paper together.
11. With your right hand, tear off a piece of tape.
12. Tape the wrapping paper together.
13. With your left hand, remove the finished pack of cards from the jig.
14. Check to see if the wrapping paper is tightly wrapped around the pack of cards. If not tighten it.
15. Place the finished pack of cards into the box.

Phase I - Teaching the work task

The teaching procedure consisted of two components: First, Ss were taught to perform the task by responding to the 15 verbal directions; then Ss were taught to perform the task without directions. The following procedures were used:

> Each S was individually escorted to and seated at a work station by T. T then gave S the first verbal direction. If S responded correctly, T gave the second direction, etc. If S responded incorrectly, T repeated the direction and gave S a second opportunity to respond. If the ensuing response was correct, T praised S and then gave the next direction; if it was incorrect T said, "No, that is not correct. Let me show you how to do this step. Watch me and do exactly what I do." T then modeled the correct response and told S to match the response she modeled. If S correctly matched the modeled response, T issued the verbal directions for the step once again. If the correct response followed, T praised S and issued the next direction. If S still responded incorrectly after T's model, a priming procedure was initiated. T said "I am going to hold your hand and guide you through this step." T then issued the verbal direction, stood behind S, reached over his shoulders, and guided him through the correct movements. T's physical assistance was gradually removed until S responded correctly to the verbal direction.

As soon as all Ss had responded perfectly to the 15 verbal directions on 3 consecutive trials, T faded (i.e., gradually removed) her verbal directions, until each S could perform the complete work task without directions.

Phase II - Baseline (Sessions 1-4)

During Phase I, each S was taught individually to perform the task. In Phase II, T brought the 4 Ss to 4 different work stations and said, "When I say 'Go' you are to start assemblying these index cards as fast as you can; try not to make any mistakes. At the end of 15 minutes I will tell you to stop. "Go." At the end of 15 minutes T said, "Stop", collected the boxes with the completed packs of index cards, replenished the materials, reset the timer, and repeated the directions to start working. The boxes with the completed packs of cards were removed from the view of Ss and counted. No feedback related to accuracy or rate was given to any S during this phase.

Phase III - Weekly Payment (Sessions 5-12 & 13-20)

Exactly the same procedure used in Phase II was used in Phase III except that in Phase III each S was told that at the end of 5 days (on Friday) he would be given a penny for each pack of index cards assembled accurately during the week. The procedures were in effect for ten consecutive school days. At the end of the 5th and the 10th day, each S was paid one penny for each accurately assembled pack; defects in inaccurately produced packs were delineated and explained. At no time during days 1 through 4 or 6 through 9 were Ss given feedback related to performance.

Phase IV - Session Payment (Sessions 21-30)

Exactly the same procedure used in Phase III was used in Phase IV, except that in Phase IV, the number of packs assembled at the end of each 15 minute session were counted in the presence of S, defects were delineated and explained, and one penny was paid for each accurately assembled pack.

Phase V - Session Payment plus high rate contingency (Number of sessions varied)

During Phase V S was told he would receive 1 penny for each pack assembled accurately. However, he was also told that he would only receive payment if he produced more in a 15 minute period than he had ever produced in the past.

Phase VI - Daily Payment (Number of sessions varied)

During Phase VI Ss were told that they would receive payment for packs accurately assembled only at the end of each day (workshop period). That is, the high rate contingency was removed. At the end of each day Ss were paid for accurately produced packs; defects in inaccurately produced packs were delineated and explained.

Phase VII - Weekly Payment (Number of sessions varied)

During Phase VII Ss were told that they were working hard and well, and now it was time for them to be treated like other hard working men in the community and receive their paychecks at the end of each work week (5 days). That is, Phase III conditions were reinstated.

Results

Prior to the start of the demonstration, four teachers were brought to a work station, told how to assemble the packs of cards, given as much practice as they felt they needed, and then asked to assemble as many packs as they could in a 15 minute time period. The number of packs the four teachers assembled correctly ranged from 65 to 75 ($\bar{X}$=72). This range was considered an operational definition of the production level acceptable for competitive employment, that 70% of that range (46-53) represented the range of production acceptable for placement in a competitive sheltered workshop, and that less than 70% represented an activity center production range.

Each assembled pack was examined by T or an assistant. If a pack was judged inaccurate, the reasons for the judgment were communicated to S at the time payment was dispensed. The most typical error was to assemble the packs too loosely.

While each S seemed to have unique problems acquiring the behaviors necessary to assemble the packs correctly, all 4 Ss acquired the correct sequence in less than three 1 hr. teaching sessions (Phase I).

During the four 15 minute baseline sessions (Phase II) Ss 1, 2, 3 and 4 respectively produced accurately an average of 26.2, 35.7, 20.7 and 15.5 packs and produced a total 9, 14, 65, 4 packs inaccurately (Figure I-A and Table I-A).

During the Weekly Payment period (Phase III), Ss 1, 2, 3 and 4 respectively produced an average of 34.6, 28.1, 27.7 and 20.2 per 15 min. session during the first week (Figure I-B and Table I-B); during the second week they respectively produced an average of 42.6, 24.0, 31.8 and 22.1 packs accurately per 15 min. session (Figure I-C and Table I-C). In addition, Ss 1, 2, 3 and 4 produced inaccurately a total of 4, 11, 28 and 15 packs during the first week and 10, 1, 20 and 17 during the second week.

During Phase IV each S received payment at the end of each 15 min. session (Session 21-30). As can be discerned from Figure I and Table 2, the mean production rates of Ss 1, 2, 3 and 4 were 54.5, 37.4, 37.6 and 29.8. While the mean rate of each S in Phase IV is higher than his mean rate in Phase III, the production patterns of each S are unique. The rates of S_1 increased cumulatively during the first six 15 minute sessions of Phase IV, but then showed a consistent decrease. The rates of S_2 and S_3 were more stable than those of S_1 in that S_1 manifested an initial increase over his previously high rate (Session 22) and maintained this rate through Session 30; and S_3 manifested the same inter session variability manifested in Phase III except that on the average, his rates were higher in Phase IV. The production pattern of S_4 in Phase IV is remarkable in that, in 7 of 10 sessions his rates increased over the previous session (Figure I-D and Table I-D).

In Phase V the high rate contingency was introduced. The average rates of Ss 1, 2, and 4 increased markedly from an average of 54.5, 37.4 and 29.8 in Phase IV to an average of 64.2, 51.8 and 39.6 in Phase V respectively (Figure I-E and Table I-E). The average rates of S_3 did not seem to be affected substantially by the high rate contingency in that he produced an average of 37.6 in Phase IV and an average of 37.3 in Phase V. It should be noted that, in an attempt to increase rates, the high rate contingency was kept in effect longer with Ss 3 & 4 than it was for Ss 1 & 2. In addition, even though the rates of Ss 1, 2 and 3 increased substantially during Phase V, the total number of inaccurately produced packs was virtually eliminated. While S_3 continued to produce inaccurately assembled packs, he produced fewer in Phase V than he had under any previous contingency.

In Phase VI, daily payment was introduced. The average rates of Ss 1, 2 and 4 increased to 76.5, 62.3 and 44.6 and, except for the performance of S_1 in trial 49, inaccurately produced packs remained negligible. The average rate of S_3 increased only slightly under daily payment; however, the number of inaccurately produced packs decreased (Figure I-F and Table I-F).

In Phase VII, weekly payments were reintroduced (as in Phase III). During the 1st week of Phase VII, Ss 1, 2, 3 and 4 accurately produced an average of 79.1, 74.1, 43.8 and 41.2 packs (Figure I-G and Table I-G). During the second week Ss 1 and 2 accurately produced an average of 90.0 and 71.7 packs (Figure I-H and Table I-H). Ss 3 and 4 remained in the high rate contingency (Phase V) longer than Ss 1 and 2, and the onset of summer vacation prevented Ss 3 and 4 from performing under the second weekly payment contingency. As can be discerned from Figure I, along with the increases obtained in production rates, concomitant decreases in the number of inaccurate packs were observed, until in Phase VII errors were virtually eliminated.

Discussion

When the performance of the four students during Phases II and III is compared with their performance during Phase VII, it can be seen that substantial increases in quality, quantity and durability occurred.

Teaching each student to assemble the packs accurately proved relatively simple in that each S learned to assemble three consecutive packs of cards within three 1-hr. training sessions. However, the relatively large number of inaccurately produced packs during Phases II and III suggest that either the training criterion was inadequate or that the contingencies in the work environment during these phases were not sufficient to maintain accurate responding. Nevertheless, records of continuous quality monitoring indicates that inaccurate packs were rarely produced by Ss 1, 2 and 4 after Phase III. The quality of performance manifested by S_3 was variable in that he produced inaccurate packs in all seven phases, although at seemingly lower rates in Phases VI and VII.

That the rates of each student increased substantially is quite apparent (compare Phases II and VII). However, only two of the four students produced within the competitive employment production range as defined here. Thus, the rate aspect of the program was a failure for two students in that the procedures used were not sufficient to teach them to produce even within the competitive sheltered workshop range. However, it should be noted that the rate of S3 increased from an average of 27.7 and 31.8 per session during the two weeks of Phase III to an average of 43.8 per session in Phase VII, and the rate of S4 increased from an average of 20.2 and 22.1 per session during the two weeks of Phase III to an average of 41.3 per session in Phase VII. Rather than assume that students 3 and 4 are incapable of producing at a competitive rate it might be more productive to examine the manner in which the task was arranged in an attempt to determine if a different arrangement would increase rates, and to manipulate different consequences (more money per unit, edibles, etc.) in an attempt to discern if those manipulated here were not sufficient to exact maximum performance. (It should be noted, however, that any changes made in the arrangement of the task would necessitate the gathering of norms using the new arrangement).

Durability was operationally defined as the accurate completion of the work task at competitive employment rates under a typical vocational payment schedule (weekly). During Phase III none of the four students met the criteria for durability. In Phase VII, however, Ss 1 and 2 clearly manifested durable performance. Ss 3 & 4 met the accuracy requirement and performed for weekly payment, but did not meet the competitive employment rate criterion. The fact that all students performed accurately at high rates (relative to Phase III) for weekly payments suggests that concer ualizing durable performance as a function of schedules of reinforcement may be more technologically sound than alluding to such inferred organismic deficits as "inability to delay gratification".

Before extrapolations are made to these and other students on this and other work tasks several factors should be consi ed. First, the work sessions sampled were only 15 minutes in duration. Whether high rates for weekly payments can be maintained in a work setting that requires a 40 hr. work week needs to be determined. However, the prevocational training program described here was only one component of the school day. One logical way to enhance the probability that performance in a community vocational setting will be similar to performance in school would be to gradually increase the amount of time a student spends in the community vocational setting while employing the procedures used here to maintain performance. Second, attentuation in the schedules of reinforcement used here did not seem to produce decrements in quality or quantity. It should be realized that schedule attenuation is dependent upon the performance of each individual. Third, the onset of the summer vacation prevented determining how long the terminal performance of each student would have been maintained under the weekly payment schedule. Fourth, the operational definition of competitive employment production rates on this task seems rather tenuous. It is quite possible that the work samples obtained from classroom teachers do not represent the production rates of workers in the competitive work community. Fifth, the manner in which the teacher changed the schedules of reinforcement needs further investigation. For example, it is possible that those students who seemed to respond to the schedule manipulations (Ss 1 & 2) were under the verbal control of the teacher. On the other hand, it is possible that the students who did not respond to the schedule manipulations were not under the verbal control of the teacher and that various non-verbal methods of communicating schedule changes might be effective in increasing the rates of some students (Ss 3 & 4) at least until verbal control is established.

Currently available evidence, including the results of this study, supports the conclusion that the job requirements of many community vocational settings are within the capabilities of retarded and severely disturbed individuals. In view of the employment difficulties evidenced by these individuals, such a conclusion clearly challenges the professional community to delineate current impediments to vocational functioning and to develop procedures which eliminate these impediments.

The approach used here was to identify responses necessary to complete the task accurately, teach the students to perform these responses in a series, and then arrange contingent consequences in an attempt to reduce the differences between the student's initial performance and that required in many community vocational settings.

Certainly, successful community employment involves more than acceptable performance on specific job skills. Appropriate recreation and leisure skills, satisfactory money management, acceptable personal grooming, functional academic skills and an absence of socially disruptive behavior must be pre-requisite to independent vocational functioning. However, current evidence provides no justification for a qualitative distinction between these and specific job skills. The most parsimonious approach appears to be teaching all required skills through direct environmental intervention, just as work skills were taught here.

Table 1

Average number of packs assembled accurately by 4 Ss during: A) Baseline; B) Weekly Payment, Week 1; C) Weekly Payment, Week 2; C) Session Payment; E) Session Payment Plus High Rate Contingency; F) Daily Payment; G) Weekly Payment, Week 1; H) Weekly Payment, Week 2.

Figure 1

Number of packs assembled correctly and incorrectly by four Ss during: A) Baseline; B) Weekly Payment, Week 1; C) Weekly Payment, Week 2; D) Session Payment; E) Session Payment Plus High Rate Contingency; F) Daily Payment; G) Weekly Payment, Week 1; H) Weekly Payment, Week 2.

TABLE I

	A	B	C	D	E	F	G	H
S_1	26.2	34.6	42.6	54.5	64.2	76.5	79.1	90.0
S_2	35.7	28.1	24.0	37.4	51.8	62.3	74.1	71.7
S_3	20.7	27.7	31.8	37.6	37.3	40.8	43.8	--
S_4	15.5	20.2	22.1	29.8	39.6	44.6	41.3	--

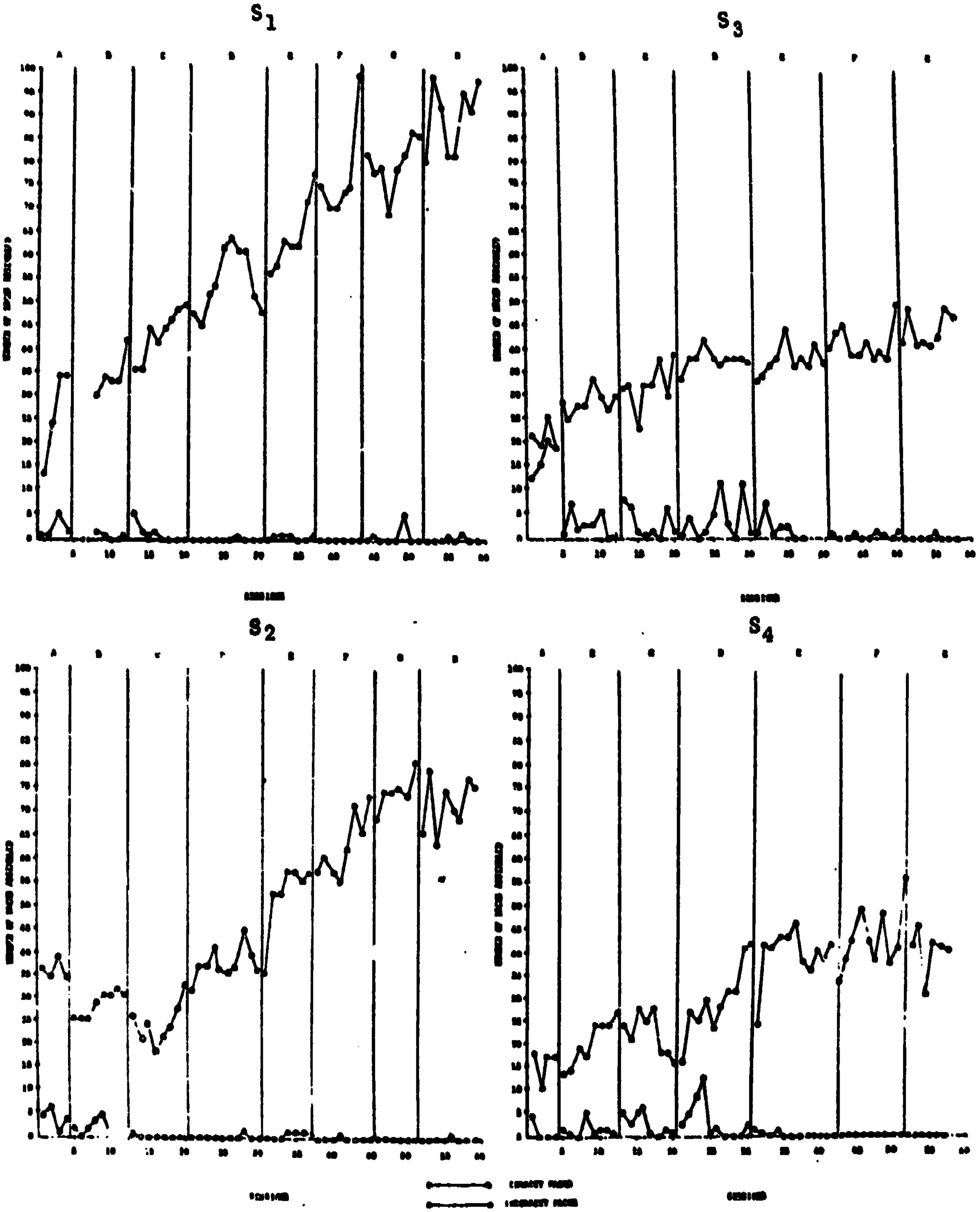


FIGURE I

References

Ayllon, T., & Azrin, N. The measurement and reinforcement of behavior in psychotics. Journal of Experimental Analysis of Behavior, 1965, 8, 357-383.

Brown, L., Johnson, J., Gadberry, E., & Fenrick, N. Increasing individual and assembly line production rates of retarded students. Training School Bulletin, 1971, 67, 206-213.

Brown, L., & Pearce, E. Increasing the production rates of trainable retarded students in a public school simulated workshop. Education and Training of the Mentally Retarded, 1970, 5, 15-22.

Brown, L., VanDeventer, P., & Perlmutter, L. Effects of consequences on production rates of trainable retarded and severely emotionally disturbed students in a public school workshop. Unpublished paper, 1971.

Burchard, J. Systematic socialization: A programmed environment for the habilitation of antisocial retardates. The Psychological Record, 1967, 17, 461-476.

Crosson, J. A technique for programming sheltered workshop environements for training severely retarded workers. American Journal of Mental Deficiency, 1969, 73, 814-818.

Evans, G., & Spradlin, J. Incentives and instructions as controlling variables of productivity. American Journal of Mental Deficiency, 1966, 71, 129-132.

Ferster, C., & Skinner, B. F. Schedules of reinforcement. New York: Appleton-Century-Crofts, 1957.

Gardner, W. I. Behavior modification in mental retardation. Chicago: Aldine-Atherton, 1971.

Greene, R., & Hoats, D. Reinforcing capabilities of television distortion. Journal of Applied Behavior Analysis, 1969, 2, 139-141.

Huddle, D. Work performance of trainable adults as influenced by competition, cooperation and monetary reward. American Journal of Mental Deficiency, 1967, 72, 198-211.

Hunt, J., & Zimmerman, J. Stimulating productivity in a simulated sheltered workshop setting. American Journal of Mental Deficiency, 1969, 74, 43-49.

Kahn, H., & Burdett, A. Interaction of practice and rewards on motor performance of adolescent mental retardates. American Journal of Mental Deficiency, 1967, 72, 422-427.

Podvin, M. The influence of music on the performance of a work task. Journal of Music Therapy, 1967, 52-56.

Zimmerman, J., Overpeck, C., Eisenberg, H., & Garlick, B. Operant conditioning in a sheltered workshop. Rehabilitation Literature, 1969, 30, 326-334.

Zimmerman, J., Stuckey, T., Garlick, B., & Miller, M. Effects of token reinforcement on productivity in multiply handicapped clients in a sheltered workshop. Rehabilitation Literature, 1969, 30, 34-41.

USE OF GROUP CONTENGENT MUSIC TO INCREASE ASSEMBLY LINE PRODUCTION RATES OF RETARDED STUDENTS IN A SIMULATED SHELTERED WORKSHOP[1]

Tom Bellamy and Ed Sontag[2]

University of Wisconsin and Madison Public Schools

Rapidly accumulating evidence indicates that the addition or re-arrangement of reinforcing consequences for work production is effective in increasing individual production rates of retarded and disturbed workers (Johnson, Haughton and LaFave, 1965; Evans and Spradlin, 1966; Podvin, 1967; Greene and Hoats, 1969; Hunt and Zimmerman, 1969; Zimmerman, Stuckey, Garlick and Miller, 1969; Brown and Pearce, 1970; Brown, Johnson, Gadberry and Fenrick, 1971). The economic significance of these findings for the competitive operation of sheltered workshops is obvious. Their significance for the habilitation and employment of retarded individuals has been demonstrated (Chaffin, 1969).

The well-defined methods of increasing individual production rates are of little value, however, to the many sheltered workshops and community vocational settings which use assembly lines or production lines in their operation. In a typical assembly line arrangement different tasks, each necessary for the completion of a product, are performed in sequence by different workers. An increase in the production rate of one worker is of little significance unless concurrent increases occur in the rates of all other workers. That is, assembly line production is accelerated only when the rates of all workers are simultaneously increased.

The successful utilization of group contingencies to alter the behaviors of groups of individuals (Sulzbacher and Houser, 1968; Schmidt and Ulrich,

[1]The investigations reported here were supported in part by grants by the Wisconsin Dept. of Public Instruction, Division of Voc. Ed., Div. for Handicapped Children, and the Madison Public Schools.

[2]The authors wish to express appreciation to Professors Richard Shores and Lou Brown, University of Wisconsin, for their interest in the investigations and assistance in preparing the manuscript.

1969; Barrish, Saunders and Wolf, 1969; Packard, 1970; Axelrod, 1971) suggests that the production rates of assembly lines may be manipulated in the same manner as individual work rates. A group contengency is one in which "the consequences that each student receives depends not only on his own behavior, but also on the behavior of other members of the group." (Axelrod, 1971, p.1). Thus a group of individuals is treated as a single behaving organism.

The purpose of the two studies reported here is to evaluate the utility of group contingencies in increasing the assembly line production rates of retarded and disturbed workers. The group contingent consequence used in both studies was music. This was chosen because the students were observed frequently to request music activities and to select these in free time, and because music is an inexpensive and available event in most vocational settings.

EXPERIMENT I

Method

Students

The four students (Ss) ranged in age from 11-1 to 12-11 ($\bar{X}$=12-1) in IQ (Stanford-Binet) from 35 to 48 ($\bar{X}$=42) and had been enrolled in public school and community special education programs from 4 to 5 years. Three Ss were diagnosed as manifesting Down's Syndrome, and the fourth had been variously described as "psychotic with a symbiotic type of disorder," "reactive emotional disturbance," and "Minimal brain injury with possible psychiatric complications." All four are currently assigned to a public school departmentalized program for trainable students. The investigation described here was conducted by a teacher (T) during scheduled classroom pre-vocational activities.

Materials

The work task involved the following materials: 8 3/4" X 11 1/2" manilla envelopes with 2-pronged latches, 8 1/2" X 11" unlined white paper; 8 1/2" X 5 1/2" unlined white paper; 3 1/2" X 8 1/2" folded letter inserts, obtained from a recent political campaign; 3" X 5" white index cards; a classroom stapler; and a 9" X 12" X 6" cardboard packaging box. In the conduction of the program T used a kitchen timer, a stopwatch, and an inexpensive classroom phonograph. One record, Children's Sing-Along by Frank Luther (Vocalion 73680) was verbally selected by Ss from available records and was used throughout the program.

Job Description

The work task consisted of stuffing, closing and packaging the manilla envelopes. S_1 took one sheet from each of 2 stacks of paper (8 1/2" X 11" and 8 1/2" X 5 1/2"), placed the smaller sheet behind the larger one, and stapled the two in the upper left corner. S_2 put the stapled sheets in a manilla envelope. S_3 placed one insert and one index card in each envelope; S_4 closed and fastened the envelope and placed it in the packaging box with the address side up.

Envelopes were considered incorrect if: (1) the staple was misplaced; (2) the papers were torn or folded; (3) the contents were incorrect; (4) the envelope was not fastened; or (5) the envelope was improperly packaged.

The behaviors involved in the desired work performance of each S were taught successfully during two 45-minute classes using verbal directions, modeling and social consequences for correct responses (e.g., "Good," "That's right," etc.). The first phase of the program began after five 10-minute practice sessions.

Procedures

Phase I: (Baseline without music). During this phase Ss were seated at their respective work stations on the production line and were instructed to, "Begin work when I say 'Go' and stop when the timer rings. Do a good job. Go." T set the timer for 10 minutes and remained seated near the record player a few feet behind Ss. When the timer rang, T collected the finished envelopes from the packaging box, counted them, and checked for accuracy. No feedback concerning accuracy or rate was given the Ss.

Phase II: (Continuous music). Procedures used in this phase were identical to those in Phase I, except that music was played continuously during each 10-minute session.

Phase III: (30 seconds of contingent music). At the beginning of each session T said, "The music will be on only after (S_4) places each envelope in the packaging box. You can keep the music on by working fast. Do a good job. Go." Ten-minute sessions were then conducted in the same manner as in previous phases, except that T used a stopwatch to give only 30 seconds of music after each envelope was packaged. When an envelope was completed, the music was turned on and the stopwatch was started at 0. If another envelope was not packaged before 30 seconds had elapsed, the music was turned off. If another envelope was completed during this time, the stopwatch was reset to 0, and the music remained on.

Phase IV: (20 seconds of contingent music). T's instructions and the procedures followed during this phase were identical to Phase III, except that only 20 seconds of music was provided after each envelope was packaged.

Phase V: (Reversal). Procedures used in Phase V were identical to those followed in Phase II.

Results

The results of Experiment I are presented in Figure I and Table I. Ss produced medians of 15.2, 19.0, 20.0 and 20.0 envelopes during Phases I, II, III, and V, respectively. Medians of 4.0, 2.3, 2.5, and 2.0 incorrectly produced envelopes were recorded during these phases. During Phase IV Ss produced a median of 27.5 envelopes; a median of 5.0 incorrectly produced envelopes was recorded.

The Mann-Whitney U Test (Siegel, 1956) was used to test the hypothesis that the rates obtained during Phase IV (20 seconds of contingent music) were sampled from the same or a lower population than those obtained during Phases II and V (Continuous music). In a one-tailed test at the .01 level, the obtained U of 34.5 allows for rejection of this hypothesis and for the conclusion that 20 seconds of contingent music resulted in higher production rates than did continuous music.

Discussion

The presentation of 20 seconds of music contingent on product completion resulted in significant increases in the assembly line production rates of retarded students. This result supports the utility of group contingencies in accelerating assembly line production and lends support to the hypothesis that music might be an effective reinforcer for the group's behavior.

The initial treatment condition, involving the presentation of 30 seconds of contingent music (Phase III), did not result in substantial gains. It should be noted, however, that the production rates during this phase were commensurate with the requirements of the contingency: Termination of the music could be avoided by completing one envelope every 30 seconds during the 10-minute sessions. The median production rate of 20.0 envelopes per session in Phase III closely approximates this requirement.

The tentative conclusions suggested by Experiment I are highly encouraging. however, a clearer demonstration of experimental control, and thus a second investigation, seems indicated.

EXPERIMENT II

A different age group and a different work task were used in Experiment II. In addition, the music consequences of work production were conjugately, rather than episodically, programmed. That is, volume attenuation replaced abrupt starting and stopping of the music.

A conjugate contingency is one in which the "intensity of a continuously available consequence is a direct function of the response rate. (Lindsley, 1964, p. 78). Attenuation of the consequent event allows for exposure to some aspects of the event during brief pauses in responding. Thereafter, continued exposure to the event requires continuous behavior. There is thus a continuous interdependence between a behavior, its consequences, and subsequent behavior (Kanfer and Phillips, 1970; Lindsley, 1963).

Method

Students

The seven students (Ss) ranged in age from 13-0 to 20-2 ($\bar{X}$=16-6) in IQ from 35 to 64 ($\bar{X}$=46.8) and had been enrolled in public school and community special education programs from 5 to 11 years ($\bar{X}$=8.3). The investigation reported here was conducted by a teacher (T) in a public school prevocational training program.

Materials

The work task involved the following materials: drapery hooks, bags and labels manufactured by Graber Company, Middleton, Wisconsin; five jigs, including 2 loaders, 2 different stapling mechanisms, and a hole punch, all of which had been used by the public school workshop to facilitate production and increase accuracy; and a box for placement of completed products. T used during the conduction of the program an inexpensive classroom tape recorder with one external speaker, an ordinary kitchen timer, recorded music, and a volume attenuator. The music used was recorded from records chosen verbally by Ss from the collection available to them during free time. These included: The Monkeys, The Girl I Knew Somewhere, Colgems Records 66-1004; Ray Charles, The Train, ABC-Paramount TRC-255-A; Johnny Tillotson, Another You, MGM Records K1 3181; Bobby Sherman, Free Now to Roam, Metromedia Records, MMS-217. The volume attenuator was constructed by modifying a long-ring kitchen timer (Westclox Division, General Time, 50043) and attaching the rotating mechanism to an L-Pads Level Control (Allied Radio Shack, 40-131). The volume attenuator was wired between the recorder and speaker during the experimental phases. Volume was thereby maintained at a barely audible level until T reset the mechanism by pulling a lever. This provided 17 seconds of music at gradually decreasing volume, until the previous level was reached.

Job Description

The work task consisted of placing 14 drapery hooks in a small plastic bag, stapling a retail label across the top of the bag in two places, and punching a hole in the center of the label.

Ss 1 and 2 placed 14 hooks in slots provided in each of the two loaders;

Ss 3 and 4 used the loaders, which were equipped with chutes, to put the hooks in plastic bags; S_5 placed a label across the top of each bag and stapled the left side; S_6 stapled the right side; S_7 punched a hole in the center of the label and placed the finished product in a box.

Products were considered incorrect if the label was not straight or if either the staples or the hole was misplaced.

Inasmuch as all Ss had worked on this task in the school workshop for two months prior to the outset of this study, no teaching procedures were necessary for correct work performance.

Procedures

Phase I (Baseline). At the beginning of each session T said, "All of you know how to do this job, so I will play music while you are working. Begin when I say 'Go' and stop when the timer rings. Do a good job. Go." T then set the timer for 10 minutes and started the recorded music. T remained seated by the tape recorder behind Ss during each session. When the timer rang, T turned off the music, collected the finished products, and checked and counted them out of Ss' view. No indication of rate or accuracy was given.

Phase II (Treatment). During this phase T instructed Ss at the beginning of each session, "You can keep the music loud by working fast. The music will be loud just after (S_7) puts a finished bag in the box, but it will fade out if you do not finish another bag soon afterwards. Begin when I say 'Go' and stop when the timer rings. Do a good job. Go." T then set the timer and turned on the tape recorder. The volume attenuator was attached, so that the music was barely audible. Immediately after S_7 put each finished product in the box, T reset the volume attenuator to maximum volume. The music automatically returned to its barely audible level in 17 seconds unless another product was completed during this time.

Phase III (Reversal). Procedures used in Phase I were reinstated.

Phase IV (Treatment). Procedures used in Phase II were reinstated.

Phase V (Reversal). Procedures used in Phases I and III were reinstated.

Results

The results of Experiment II are presented in Figure II and Table II. Ss produced medians of 17.5, 15.0 and 15.5 bags during Phases I, III and V respectively. Medians of 0.4, 1.5, and 1.0 incorrectly produced bags were recorded during these phases. During Phases II and IV Ss produced medians of 22.0 and 24.5 bags. Medians of 0.8 and 0.5 incorrectly produced bags were produced during these phases.

The Mann-Whitney U Test (Siegel, 1956) was used to test the hypothesis that the rates obtained during Phases II and IV (Treatment conditions) were sampled from the same or a lower population than those obtained during Phases I, III and V (Baseline conditions). In a one-tailed test at the .01 level, the obtained U of 18, which corresponds to a z of 3.74, allows for rejection of this hypothesis and for the conclusion that the treatment condition resulted in higher production rates than did the baseline condition.

Discussion

The two investigations reported here were applications of experimental evidence of the effectiveness of group contingencies in changing concurrent behaviors of group members, and the utility of conjugately programmed behavior consequences to the prevocational training of retarded students. The result was an inexpensive and effective means of producing significant increases in the assembly line production rates of two groups of retarded students.

The results of both studies are consistent with the effects of previously reported group contingencies, and they demonstrate the successful use of such contingencies in assembly line operations. A number of authors have suggested that the effectiveness of group contingencies may be in part the result of interactions among group members (e.g., Sulzbacher and Houser, 1968; Schmid and Ulrich, 1968; Packard, 1970). Task related prompts and comments were often observed during the treatment phases of the investigation reported here, but no reliable measures of these were obtained.

The results of Experiment II provide demonstrational evidence that the conjugate programming of consequent events may be quite effective in applied settings. This is consistent with the successful utilization of conjugate contingencies in a variety of laboratory settings (e.g., Lindsley, 1963; Morgan and Lindsley, 1966). Further investigation of their utility seems warranted in vocational and training situations.

Music is readily available in most work settings, and alterations required so that music can be heard immediately after desired behavior appear relatively inexpensive. The results of the investigations reported here support Podvin's (1967) conclusion that music may serve as an accelerating consequence for work behaviors. The results also seem to support the contention that attention should be directed to the use of music as a behavior consequence, as well as to the more typical uses which emphasize discriminative stimulus function (Madsen, Cotter and Madsen, 1968).

In the two investigations reported here, normal public school resources were used to demonstrate that group contingent music, presented both episodically and conjugately, provides an effective means of accelerating the assembly line production of retarded students. More extended investigations and clearer demonstrations of experimental control are certainly desirable. However, these studies do provide optimistic demonstrational evidence of the ease and economy with which the employability of retarded students can be enhanced.

FIGURE I

Number of envelopes completed by an assembly line during: I) Baseline; II) Continuous music; III) 30 seconds of contingent music; IV) 20 seconds of contingent music; and V) Continuous music.

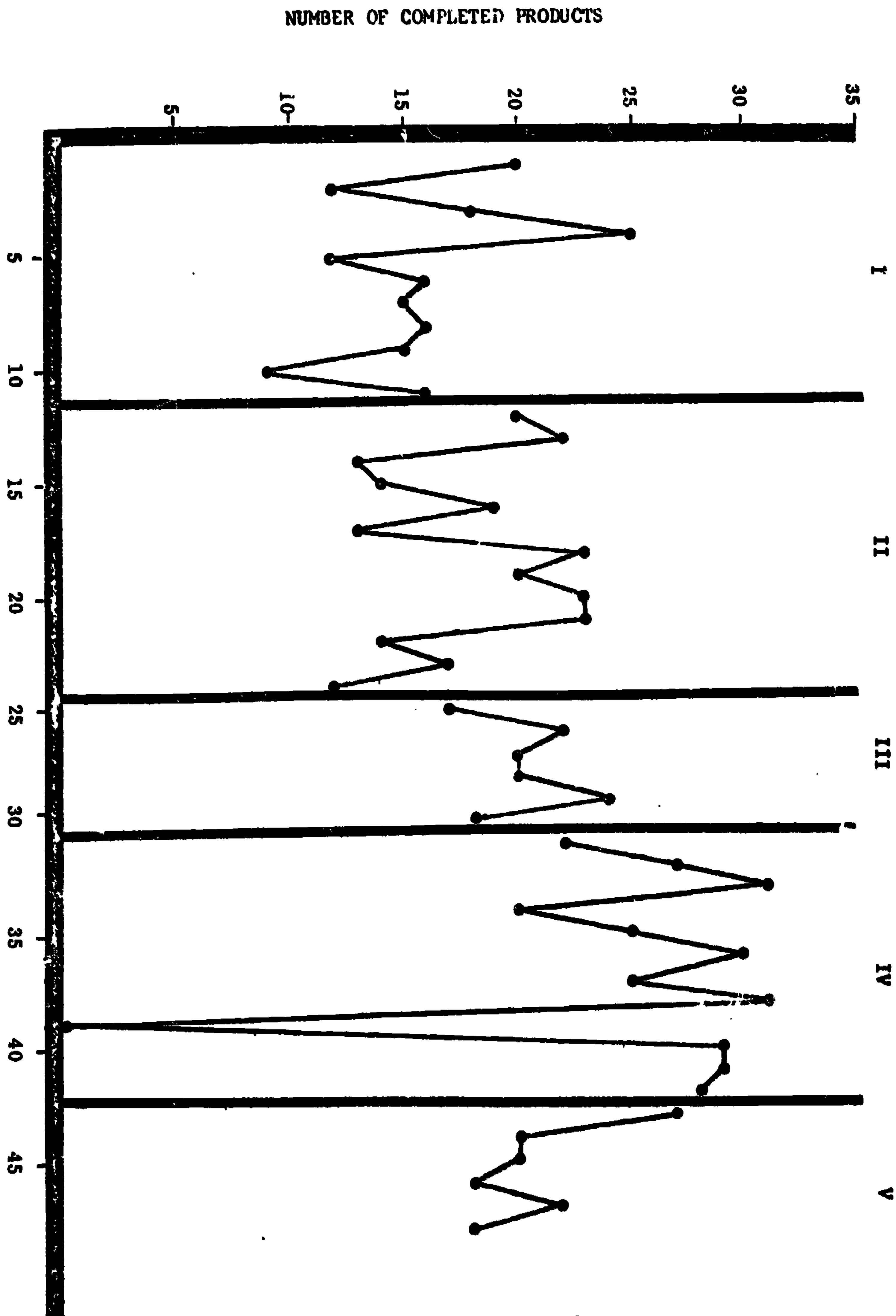

NUMBER OF COMPLETED PRODUCTS
35
30
25
20
15
10
5
I
II
III
IV
V
5
10
15
20
25
30
35
40
45
SESSIONS

TABLE I

Median assembly line production rates in ten-minute time samples during: Phase I, Baseline; Phase II, Continuous music; Phase III, 30 seconds of contingent music; Phase IV, 20 seconds of contingent music; and Phase V, Continuous music.

PHASE	I	II	III	IV	V
TOTAL	15.2	19.0	20.0	27.5	20.0
INCORRECT PRODUCTS	4.0	2.3	2.5	5.0	2.0

FIGURE II

Number of bags completed by an assembly line during: I) Baseline; II) Treatment; III) Reversal; IV) Treatment; and V) Reversal.

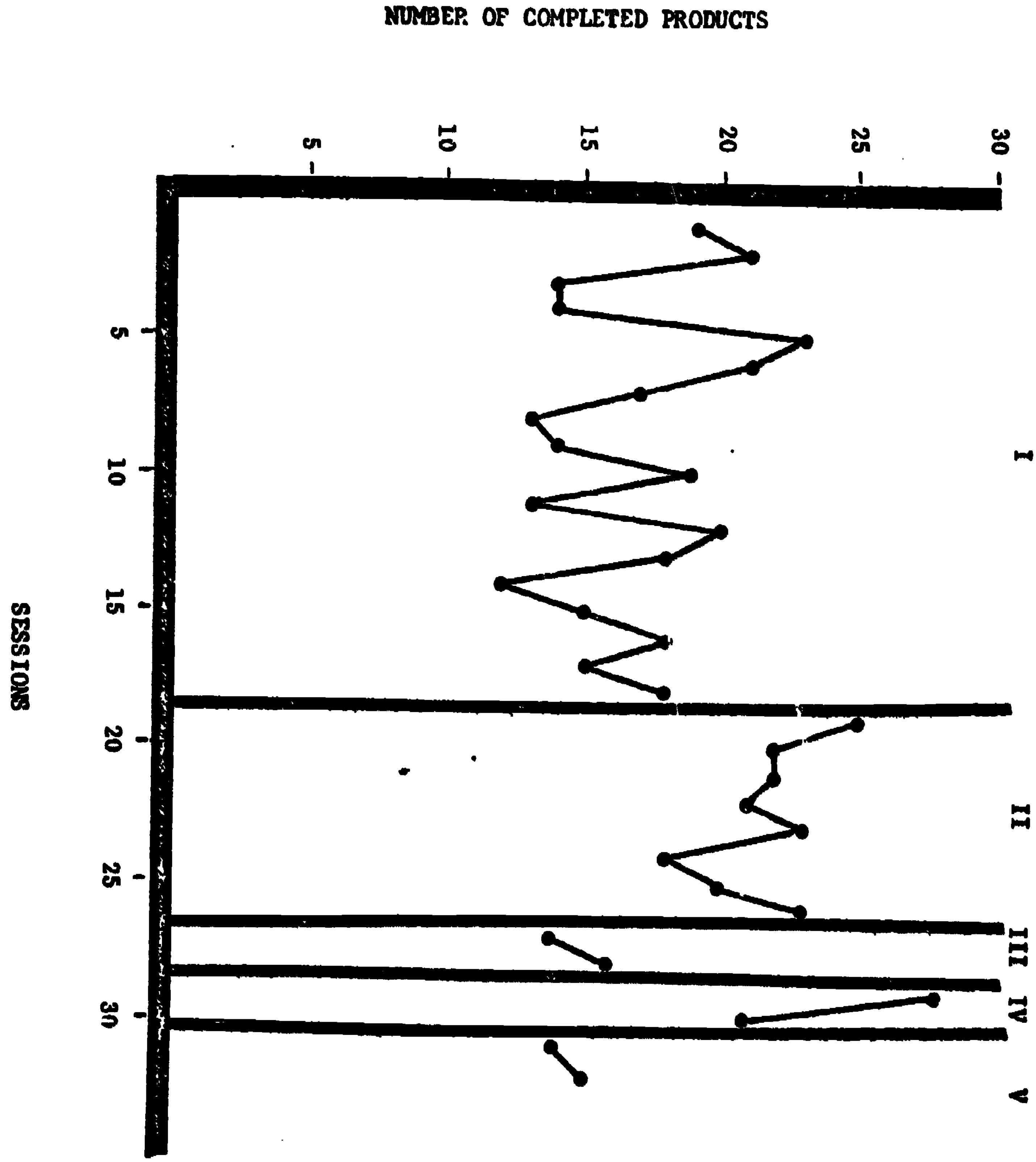

NUMBER OF COMPLETED PRODUCTS
30
25
20
15
10
5
SESSIONS
5
10
15
20
25
30
I
II
III
IV
V

TABLE II

Median assembly line production rates in ten-minute time samples during: Phase I, Baseline; Phase II, Treatment; Phase III, Reversal; Phase IV, Treatment; and Phase V, Reversal.

PHASE	I	II	III	IV	V
TOTAL	17.5	22.0	15.0	24.5	15.5
INCORRECT PRODUCTS	0.4	0.8	1.5	0.5	1.0

Axelrod, S. Comparison of individual and group contingencies in two special classes. (Unpublished paper, 1970.)

Barrish, H., Saunders, M., & Wolf, M. Good behavior game: Effects of individual contingencies for group consequences on disruptive behavior in a classroom. Journal of Applied Behavior Analysis, 1969, 2, 119-124.

Brown, L., Johnson, J., Gadberry, E., & Fenrick, N. Increasing individual and assembly line production rates of retarded students. Training School Bulletin, 1971, 67, 206-213.

Brown, L., & Pearce, E. Increasing the production rates of trainable retarded students in a public school simulated workshop. Education and Training of the Mentally Retarded, 1970, 15-22.

Chaffin, J. Production rate as a variable in the job success or failure of educable mentally retarded adolescents. Exceptional Children, 1969, 35, 533-535.

Evans, G., & Spradlin, J. Incentives and instructions as controlling variables of productivity. American Journal of Mental Deficiency, 1966, 71, 129-132.

Greene, R., & Hoats, D. Reinforcing capabilities of television distortion. Journal of Applied Behavior Analysis, 1969, 2, 139-141.

Hunt, J., & Zimmerman, J. Stimulating productivity in a simulated sheltered workshop setting. American Journal of Mental Deficiency, 1969, 74, 43-49.

Johnson, R., Haughton, E., & Lafave, H. Behavior therapy - Use in a sheltered workshop. Diseases of the Nervous System, 1965, 26, 350-354.

Kanfer, F., & Phillips, J. Learning foundations of behavior therapy. New York: John Wiley, 1970.

Lindsley, O. Experimental analysis of social reinforcement: Terms and methods. American Journal of Orthopsychiatry, 1963, 33, 624-633.

Lindsley, O. Direct measurement and prosthesis of retarded behavior. Journal of Education, 1964, 147, 62-81.

Madsen, C. K., Cotter, V., & Madsen, C. H. A behavioral approach to music therapy. Journal of Music Therapy, 1968, 5, 69-71.

Morgan, B., and Lindsley, O. Operant preference for stereophonic over monophonic music. Journal of Music Therapy, 1966, 135-143.

Packard, R. The control of "classroom attention:" A group contingency for complex behavior. Journal of Applied Behavior Analysis, 1970, 3, 13-28.

Risley, T., & Baer, D. Operant conditioning: Develop is a transitive, active verb. In B. Calwell and H. Riccuiti, (Eds.), Review of child development research, Volume III: Social influence and social action. In press.

Schmid, G., and Ulrich, R. Effects of group contingent events upon classroom noise. Journal of Applied Behavior Analysis, 1969, 2, 171-179.

Siegel, S. Nonparametric statistics for the behavioral sciences. New York: McGraw Hill, 1956.

Sulzbacher, S., & Houser, J. A tactic to eliminate disruptive behaviors in the classroom: Group contingent consequences. American Journal of Mental Deficiency, 1968, 73, 88-90.

Zimmerman, J., Stuckey, T., Garlick, B., & Miller, M. Effects of token reinforcement on productivity in multiply handicapped clients in a sheltered workshop. Rehabilitation Literature, 1969, 30, 34-41.

Part III

DEVELOPMENT OF FUNCTIONAL HOME LIVING SKILLS

Purpose of functional home living skills

The acquisition of vocational skills and the attainment of gainful community employment are reasonable and laudable objectives for trainable students. The attainment of these objectives is of practical significance, however, only if the students' behaviors satisfy demanding contingencies in non-vocational environments. Some degree of self sustaining domestic skill is necessary whether an individual lives with his parents, resides in a boarding home or half-way house, or maintains more independent arrangements. If such skills are not present, a trainable individual well might be considered an economical or social detriment to a community, regardless of his vocational success. That is, successful community vocational placement of trainable students presupposes that the social and economic cost of caring for them will not be over-shadowed by their job contributions and earnings.

Consider the skills involved in minimal independent living of an employed individual. He must wake up to an alarm, make his bed, shower, groom, get dressed, prepare breakfast, eat breakfast, wash dishes, travel to and from work, purchase or prepare lunch and dinner, etc. In addition to daily fluctuations in these behaviors, his skills must be adequate for housekeeping, traveling, shopping and laundry chores. It is painfully obvious to the parents of most trainable students that their children often do not acquire these skills, as others apparently do, by simple exposure to a typical home environment. Currently available experimental evidence suggests, however, that trainable students can acquire many of these behaviors with systematic instruction.

The purpose of home living instruction in this program is to utilize available public school space and equipment to teach representative domestic skills. For each skill selected as an appropriate sample, a sequence of behaviors is defined, the circumstances under which these behaviors should occur are specified, and behavior consequences which might facilitate their acquisition are identified. The behaviors involved in the selected skills are then taught in the appropriate settings using specific teaching procedures in which behavior antecedents and consequences are systematically programmed. Effective techniques of measuring the acquisition of these behaviors are currently being developed.

It may not be possible in a public school setting to teach all the skills required for successful home living. Extensive utilization of community resources and reliance on parental involvement in school programs might finally prove necessary. The practical use of skills acquired in school and the development of specific skills such as traveling and shopping, suggest the utility of systematic teaching outside the school setting. The approach of home living instruction in this program is cumulative. Specific skills are identified and taught. Considerable progress has been made, but quite obviously, much remains to be taught, both in and outside the classroom.

<u>Development of functional home living skills</u>

The development of home living skills has involved instruction in three general areas: cooking, housekeeping, and laundry.

<u>Cooking</u>. From the viewpoint of a behavioristic task analysis, cooking involves reading a set of directions and performing the behaviors as directed in sequence. To date, the cooking program has involved instruction in: (1) identifying kitchen utensils and food objects; (2) reading recipe directions; (3) reading recipe directions and performing the specified behaviors in sequence.

<u>Teaching students to identify kitchen utensils and food objects</u>. Procedures similar to those used by Brown, Jones, Troccolo, Heiser and Bellamy (1971) to teach object labeling were used in this program to teach identification of basic kitchen objects. Although personnel and procedural difficulties precluded the reliable mea-

surement of acquisition of these identification responses, identification of the following objects was taught as necessary for completing specific recipes:

Eggs
[illegible]
soft [illegible]
fried eggs
scrambled [illegible]
water
salt
pepper
egg [illegible]
butter
margarine
milk
f [illegible]
sugar
baking [illegible]
cooking [illegible]
pancake
syrup
fr [illegible]
cream [illegible]
oatmeal
biscuits
Bisquick
bacon

[illegible]
[illegible]
[illegible]
[illegible] sticks
[illegible] ble oil
[illegible] sauce
[illegible] loaf
[illegible] ger
[illegible]
[illegible]
[illegible] table
[illegible] mashed potatoes
[illegible]
[illegible] ate pudding
[illegible]
[illegible] colate
[illegible] akes
[illegible] ps
[illegible]
[illegible] sugar
[illegible] tening
[illegible] lla

[illegible] ils

knife
vegetable [illegible]
grater
wire [illegible]
can [illegible]
cutting [illegible]
large [illegible]

measuring [illegible]
measuring spoons [illegible]
liquid measuring cup

straight edged [illegible]
rubber [illegible]
wooden [illegible]
rotary [illegible]
mixing bowl
serv [illegible]
serv [illegible]
serving [illegible]
large [illegible]

[illegible] bowl

wire rack
cookie cutters
wide spatula
rolling pin and cover
muffin pan
Teflon spatula and spoon
dessert plate
cups and saucer

Teaching students to read recipe directions. Procedures patterned after those developed by Brown and Perlmutter (1971) were used to teach students to read directions for specific recipes. Vocabulary words involved in the recipes included, in addition to the objects listed above, the following words:

READING VOCABULARY

Nouns

kitchen
pan
burner
timer
sink
knife
dish
cover
tablespoon
teaspoon
frying pan
saucer
wide spatula
plate
bowl
fork
spoon
mixing bowl
rotary egg beater
electric mixer
beaters
amount
hour
faucet

utensils
soup ladel
pancake turner
serving dish
cup
cookie sheet
aluminum foil
table
oven
paper towel
tongs
coffee maker
basket
mug
glass
quart pitcher
toaster
sieve
loaf pan
hot pads
towel
envelope
chunk

vegetable peeler
refrigerator
paper baking cups
muffin pans
sifter
wire rack
fingers
baking pan
broiling rack
garbage
bottom
sides
mixture
contents
hole
bubbles
slice
edge
space
strip
jar
box

Adjectives

cold
hot
high
warm
carefully
medium
full
wet
shiny
big
brown
flat
half

half
both
individual
thin
thick
dark
clean
large
small
whole
sharp
cool
tender

tiny
clean
flat
round
dry
wet
frozen
canned
fresh
smooth
solid
softened
electric

Verbs

put	slide	fill
cover	cook	drain
turn	lift	wipe
heat	measure	wash
boil	scrape	perk
set (timer)	plug	bring
rings	grease	add
take	frost	simmer
pour	remove	place
crack	bake	spread
peel	wait	scoop
eat	touch	sprinkle
stand	serve	wrap
melt	beat	wash
make	cut	pat
pull	mix	broil
open	tear	
drop	fold	

Teaching students to read recipe directions and perform specified behavior in sequence. Procedures developed by Brown and Perlmutter (1971) were used as necessary to teach following single written directions. After this skill was acquired, following all the written directions in a recipe was taught through the systematic application of a time-honored approach: the students were allowed to eat what they cooked. Although this approach seemed to prevent precise measurement of behavior acquisition, the teacher's reports suggest that moderate success can be claimed. Following is a list of recipes involved in the cooking curriculum for the various classes:

1) A. BREAKFAST

Hardboiled eggs
Softboiled eggs
Fried eggs
Scrambled eggs
Pancakes
French Toast
Oatmeal - instant
Cream of Wheat
Biscuits
Bacon
Sausage
Tea
Coffee
Orange Juice
Toast
Cold Cereal

(2) B. LUNCH

Soup - Campbell's condensed
Soup - Lipton
Sandwiches
  Peanut Butter and Jelly
  Egg Salad
  Bologna (Luncheon meat)
Macaroni and Cheese - Kraft Dinner
Hot Dogs
Fish Sticks

(3) C. DINNER

1. Meats
  Meat Loaf
  Hamburgers
  Baked Chicken
  Broiled Chicken
  Broiled Pork Chops (or broiled steak)
  Steak or Pork Chops with Cream of Mushroom Soup
  Sliced Fried Ham

2. Vegetables

  Frozen
  Canned
  Fresh
  Instant Mashed Potatoes

3. Desserts

  Instant Chocolate Pudding
  Jello
  Chocolate Cup Cakes
  Chocolate Chip Cookies
  Bread Mixes - Banana, Cranberry, Nut

Specified sequential behaviors to prepare foods for breakfast

EGGS - Hard Cooked Eggs

1. Put eggs in pan.
2. Cover eggs in pan with cold water.
3. Turn burner on to high.
4. Heat pan until water boils.
5. When water boils set timer for 15 minutes.
6. When timer rings turn burner to off.
7. Take pan to sink.
8. Pour hot water out.
9. Put cold water in pan on eggs.
10. Crack egg shells with knife.
11. Peel (take shell off) eggs with fingers.
12. Put eggs on a dish.
13. Put egg shells into the garbage.
14. Salt and pepper eggs.
15. Eat.

BREAKFAST

EGGS - Soft Boiled Eggs

1. Put eggs in pan.
2. Cover eggs with warm water.
3. Turn burner on to high.
4. Put pan with eggs and water on burner.
5. Heat until water boils.
6. Take pan off burner.
7. Turn burner to off.
8. Put a cover on the pan.
9. Let the pan stand for 2-4 minutes.
10. Pour hot water out of pan into sink.
11. Put cold water in pan on eggs.
12. Crack egg with a knife.
13. Take egg out of shell with a knife.
14. Put egg in a dish.
15. Put egg shells in the garbage.
16. Salt & pepper.
17. Eat.

BREAKFAST

EGGS - Fried Eggs, Sunny Side Up

1. Crack egg carefully; open with a knife.
2. Pull egg shell apart with fingers.
3. Let egg drop out of shell onto a saucer.
4. Put egg shell in garbage.
5. Put 3 tablespoons butter or margarine in a frying pan.
6. Turn on burner to medium.
7. Melt butter in frying pan.
8. Make butter cover the bottom of the pan.
9. Slide egg from saucer into frying pan.
10. Let eggs cook in pan until they are the way you like them.
11. Salt and pepper.
12. Slide a wide spatula under the egg.
13. Lift egg out of pan.
14. Put egg on plate.
15. Eat.

BREAKFAST

EGGS - Scrambled Eggs For 1 Person

1. Crack 2 eggs this way:

    a. Crack egg shell with a knife.

    b. Pull egg shell apart with fingers.

    c. Drop egg into a bowl. Make sure there is no egg shell in bowl. Put all egg shells in garbage.

2. Measure 2 tablespoonsful of milk. Pour into bowl.

3. Measure 1/8 teaspoonful of salt. Pour into bowl.

4. Stir mixture with a fork.

5. Put 3 tablespoons butter or margarine into a frying pan.

6. Turn on burner to low heat.

7. Melt butter in frying pan.

8. Make butter cover the bottom of the pan.

9. Pour mixture from bowl into frying pan.

10. Turn burner to medium heat.

11. Stir eggs in frying pan with wide spatula.

12. Scrape bottom of pan with wide spatula.

13. Do not let eggs stick to bottom of frying pan.

14. Eggs are done when they are wet but are still shiny.

15. Take eggs out of pan with wide spatula.

16. Put eggs on a plate.

17. Eat.

BREAKFAST

PANCAKES - Scratch, without mix.

1. Measure 2 cups flour.
2. Put flour into a large mixing bowl.
3. Measure 1 teaspoon salt.
4. Pour salt into mixing bowl.
5. Measure 2 tablespoons sugar.
6. Pour sugar into mixing bowl.
7. Measure 2 teaspoons baking powder.
8. Pour baking powder into mixing bowl.
9. Stir mixture in mixing bowl with a big spoon.
10. Crack one egg with a knife.
11. Pull egg shell apart with fingers.
12. Drop egg into a small bowl.
13. Make sure there is no egg shell in bowl.
14. Put egg shell in the garbage.
15. Beat egg in small bowl with rotary egg beater.
16. Measure 1 cup milk.
17. Pour 1 cup milk into bowl with egg.
18. Beat egg and milk with rotary egg beater.
19. Pour egg and milk mixture into large mixing bowl with flour, salt, sugar and baking powder.
20. Mix with a large spoon.
21. Measure 2 tablespoons cooking oil.
22. Pour cooking oil into mixing bowl.
23. Take mixing bowl to electric mixer.
24. Plug electric mixer in.
25. Insert beaters into correct holes.

26. Turn beater on to medium.

27. Turn bowl so all of contents get mixed.

28. Turn off when mixture is smooth.

29. Measure 3 tablespoons of cooking oil.

30. Put cooking oil in frying pan.

31. Turn burner to low.

32. Make sure cooking oil covers all of the bottom of the frying pan.

33. Fill a soup ladle half full with pancake mixture.

34. Pour the mixture into frying pan.

35. Make more pancakes. Make sure they don't touch.

36. Turn pancakes over with a pancake turner when you see bubbles on the top of the pancakes.

37. Wait until bottom of pancake is brown.

38. Take pancake out of frying pan with pancake turner.

39. Put on serving dish.

40. Serve with syrup and butter.

41. Eat.

BREAKFAST

FRENCH TOAST

1. Crack 2 eggs into a bowl this way:

   a. Crack egg shell with a knife.
   b. Pull egg shell apart with fingers.
   c. Drop egg into a bowl.
   d. Make sure there is no egg shell in bowl.
   e. Put all egg shells in garbage.

2. Measure 1/2 cupful of milk. Add milk to bowl.
3. Measure 1/4 teaspoon salt. Add salt to bowl.
4. Beat this mixture with an egg beater.
5. Pour this mixture into a flat pan.
6. Cut 6 pieces of bread in half.
7. Put 3 tablespoons butter or margarine into a frying pan.
8. Turn on burner to low heat.
9. Melt butter in frying pan.
10. Make sure bottom of pan is covered with melted butter.
11. One at a time, put each slice of bread in mixture in flat pan.
12. Turn bread over with a fork.
13. Make sure both sides of bread are all covered with egg mixture.
14. Lift bread out of egg mixture with fork.
15. Put bread in frying pan.
16. Turn burner to medium heat.
17. When bread is brown on bottom, turn bread over with a wide spatula.
18. When bread is brown on both sides take out of frying pan with a wide spatula.
19. Put on a serving plate.
20. Turn burner off.
21. Serve with syrup and butter.
22. Eat.

BREAKFAST

HOT CEREAL - Cream of Wheat (serving for 3)

1. Measure 2 cups water.
2. Pour 2 cups water into pan.
3. Measure 1/4 teaspoon salt.
4. Pour 1/4 teaspoon salt into pan.
5. Stir with a spoon.
6. Turn burner to high.
7. Heat pan until water boils.
8. Measure 1/2 cup Cream of Wheat.
9. Pour 1/2 cup Cream of Wheat into boiling water.
10. Turn burner to medium heat.
11. Cook mixture for 5 minutes. Stir mixture all the time.
12. Turn burner to off.
13. Put Cream of Wheat in bowls.
14. Add sugar and milk.
15. Eat.

BREAKFAST

HOT CERAL - Oatmeal, Instant (serving for 3)

1. Measure 2 cups water.
2. Pour 2 cups water into pan.
3. Measure 1/2 teaspoon salt.
4. Pour 1/2 teaspoon salt into pan.
5. Stir with a spoon to mix salt.
6. Turn burner on to high.
7. Heat pan until water boils.
8. Measure 1 cup oatmeal.
9. Add 1 cup oatmeal to boiling water.
10. Cook oatmeal for 1 minute.
11. Stir oatmeal. Turn burner to off.
12. Put oatmeal in individual bowls.
13. Add milk and sugar.
14. Eat.

BREAKFAST

COLD CEREAL

1. Open cereal package carefully.
2. Pour cereal into a bowl.
3. Add milk to taste.
4. Add sugar to taste.
5. Eat.

BREAKFAST

BISCUITS

1. Turn oven on to 450°.
2. Measure 1 cupful of Bisquick mix.
3. Put Bisquick mix into a small bowl.
4. Measure 1/4 cupful of water.
5. Pour into bowl with Bisquick mix.
6. Stir mixture with a fork.
7. Put a cookie sheet on the table.
8. Bring the box of aluminum foil to the table.
9. Measure how much aluminum foil you need to cover the cookie sheet.
10. Tear off the aluminum foil.
11. Put foil on pan and fold it over the edges.

To make one biscuit:

12. Fill a teaspoon with mixture from bowl.
13. Push mixture off spoon onto cookie sheet with another spoon.
14. Make 4 biscuits.
15. Leave space between biscuits.
16. Put biscuits in oven.
17. Set timer for 10 minutes.
18. When timer rings take biscuits out of oven.
19. Take biscuits off cookie sheet with the wide spatula.
20. Put biscuits on a plate.

To eat biscuits:

1. Cut biscuit in half with knife.
2. Put butter on biscuit with knife.
3. Eat.

BREAKFAST

BACON

1. With a fork slowly peel each strip of bacon from the package.
2. Put the strips of bacon in a frying pan. Put them so they are not on top of each other.
3. Turn on burner at medium heat.
4. Turn bacon over with a fork when it is brown on the bottom.
5. Cook for 6-8 minutes. Make sure both sides of bacon are brown.
6. Turn burner to OFF.
7. Take bacon out of pan with a fork. Put bacon on a paper towel to drain.
8. Put bacon on a serving plate.
9. Eat.

To clean frying pan:

1. Pour grease from pan into an empty can or bottle.
2. Wipe out pan with a paper towel.
3. Wash pan.

BREAKFAST

SAUSAGE LINKS

1. Take links out of package.
2. Put them in a cold frying pan.
3. Measure 1/4 cup cold water.
4. Pour 1/4 cup cold water into frying pan.
5. Turn on burner to low heat.
6. Put frying pan on burner.
7. Put cover on frying pan.
8. Cook for five minutes.
9. Pour all the water out of the frying pan into the sink.
10. Put frying pan back on burner with the cover off.
11. Cook the sausages for 12-14 minutes. Turn sausages with tongs while they cook so all sides get brown.
12. Turn burner to OFF.
13. Take sausages out of frying pan with tongs.
14. Put sausages on a paper towel to drain.
15. Put sausages on serving plate.
16. Serve.

To clean frying pan: same as for bacon.

SAUSAGE PATTIES

1. Pull back plastic covering from sausage roll, only for as much as you need.
2. Cut sausage in thin slices with a knife.
3. Put the slices in a cold frying pan.
4. Turn on burner to low heat
5. Put frying pan on burner.
6. [illegible] 0 minutes.
7. Turn slices over with a wide spatula.
8. Cook for 10 minutes more. 3 1/2 min. turn burner to off.
9. Take slices out of pan with a wide spatula.
10. Put slices on a paper towel to drain.
11. Pat off grease with another paper towel.
12. Put slices on serving plate.
13. Serve.

To clean frying pan:

1. Pour grease from pan into an empty can or bottle
2. Wipe out pan with a paper towel.
3. Wash pan.

BREAKFAST

HOT TEA

1. Put cold water into a small pan.
2. Turn burner to high.
3. Heat water to boiling.
4. Place a tea bag in a tea cup.
5. Pour boiling water into the tea cup.
6. Turn burner to off.
7. Leave tea bag in cup until tea is as dark as you like it.
8. Take tea bag out of cup and put it in the garbage.
9. Serve tea in tea cup with saucer.
10. Add sugar, lemon juice; milk as desired.

BREAKFAST

INSTANT COFFEE

1. Put water in a pan.
2. Turn burner to high.
3. Heat water to boiling.
4. Measure 1 full teaspoon instant coffee.
5. Put 1 teaspoon coffee in a coffee cup.
6. Pour boiling water into coffee cup until cup is full.
7. Stir with a teaspoon.
8. Add sugar and/or cream as desired.

PERCOLATOR COFFEE

1. Make sure coffee maker is clean.
2. Put cold water into coffee maker up to the amount (line) needed.
3. Put the basket in the coffee maker.
4. Measure coffee with a tablespoon. Put 1 tablespoon in basket for every cup you need.
5. Put the cover on the basket.
6. Turn burner on to high.
7. Bring coffee to boiling.
8. When coffee boils turn burner to low.
9. Perk gently for 6-8 minutes. Turn burner to off.
10. Take basket out of coffee pot. Put coffee grounds in garbage.
11. Serve coffee in a mug or coffee cup with saucer.
12. Make sure coffee is hot when you serve it.

BREAKFAST

ORANGE JUICE - small can

1. Open can.
2. Pour juice into a 1 quart pitcher.
3. Fill can with cold water and pour water into pitcher 3 times.
4. Stir with a large spoon to mix.
5. Make sure juice is fully mixed - to see if it has settled on the bottom.
6. Pour juice into glasses.

TOAST

1. Plug in toaster.
2. Put 1 piece of bread in toaster.
3. Push handle down to start.
4. Wait for toast to pop up.
5. Take toast out of toaster.
6. Put toast on small plate.
7. Butter toast with a kinfe.
8. Eat.

CINNAMON TOAST

1. Measure 2 full tablespoons of sugar.
2. Put sugar in a dish.
3. Measure 1 teaspoon cinnamon.
4. Add cinnamon to dish with sugar.
5. Stir sugar and cinnamon together.
6. Put a thin layer of this mixture on a piece of hot buttered toast.

Specified sequential behaviors to prepare foods for lunch

SOUP - CAMPBELL'S CONDENSED

1. Open can.
2. Pour soup into pan.
3. Fill can with water/milk.
4. Pour water/milk into pan.
5. Put pan on burner.
6. Turn burner to high.
7. Stir soup until soup bubbles.
8. Turn burner off.
9. Ladel soup into bowls with a ladel.

SOUP - LIPTON

1. Tear soup envelope open.
2. Pour dry soup into pan.
3. Measure 3 cups full of cold water.
4. Pour water into a pan.
5. Put pan on burner.
6. Turn burner on high until soup boils.
7. Turn burner to medium heat.
8. Let soup simmer on stove for 15 minutes.
9. Stir.
10. Ladel soup into bowls with ladel.

LUNCH

SANDWICHES

<u>Peanut Butter and Jelly</u>

1. Open the peanut butter jar.
2. Put a knife into the peanut butter.
3. Lift out peanut butter on the knife.
4. Scrape it onto a piece of bread.
5. Spread the peanut butter so that it covers one whole side of the piece of bread.
6. Put cover back on jar.
7. Repeat steps 1-6 for putting jelly on another piece of bread.
8. Place the two pieces of bread together.
9. Put jelly side on the peanut butter side.
10. Cut the sandwich in half with a sharp knife.
11. Serve on a plate.

LUNCH

SANDWICHES

Egg Salad Sandwiches

1. Put 4 eggs in a pan.
2. Cover eggs with water from faucet.
3. Put pan on burner.
4. Turn burner on high.
5. When water begins to boil, set timer for 6 minutes.
6. When buzzer rings, take pan off stove.
7. Carry pan to sink.
8. Run cold water over eggs, until they are cool.
9. Peel eggs with fingers.
10. Put egg-shells in garbage.
11. Put eggs in a small mixing bowl.
12. Break eggs into little pieces with a fork.
13. Add salad dressing one tablespoon at a time. Mix.
14. Add salt. Add 1/2 onion cut in small pieces.
15. Put egg salad on top of a piece of bread with a fork.
16. Spread the egg salad with a knife.
17. Put another piece of bread on top to make a sandwich.
18. Cut egg salad sandwich in half.
19. Serve on a plate.

LUNCH

SANDWICHES

Bologna Sandwich (Luncheon Meat)

1. Open a jar of mayonnaise.
2. Scoop out mayonnaise and put it on a piece of bread.
3. Spread the mayonnaise so that it covers the whole side of bread.
4. Cover another piece of bread with mayonnaise.
5. Put a piece of bologna on each piece of bread.
6. Put the two pieces of bread and bologna together to make a sandwich.
7. Cut the sandwich in half.
8. Serve on a plate.

LUNCH

KRAFT MACARONI AND CHEESE DINNER - 7 1/4 oz. package

1. Measure 6 cups of water into a large pan.
2. Measure 1 teaspoon salt.
3. Add salt to water in pan. Stir.
4. Put pan on burner.
5. Turn burner on to high.
6. Heat water until it boils.
7. Add macaroni to boiling water.
8. Stir.
9. Boil macaroni in water for 7 minutes.
10. Be careful water does not boil over the side of the pan.
11. Turn burner off when macaroni is tender.

To drain macaroni: Hold a sieve over the sink.

12. Pour the water and macaroni into the sieve.
13. Pour the macaroni from the sieve into a bowl.
14. Measure 1/4 cup milk.
15. Add 1/4 cup milk to macaroni.
16. Measure 3 tablespoons butter or margarine.
17. Put butter on top of macaroni.
18. Sprinkle cheese from envelope on top of macaroni.
19. Mix well with macaroni.
20. Salt and pepper macaroni.
21. Put macaroni and cheese in a serving dish.
22. Serve.

LUNCH

HOT DOGS - BOILED

1. Half fill pan with water.
2. Put pan on burner.
3. Turn burner to high.
4. Put hot dogs in pan when water boils.
5. Put a cover on pan.
6. When water boils, take pan off burner.
7. Turn burner OFF.
8. Let pan stand with hot dogs inside covered for 10 minutes.
9. Take pan to sink.
10. Pour hot water into sink.
11. Put hot dogs in buns using tongs.
12. Put catsup or mustard on hot dog.
13. Serve.

PAN FRIED FISH STICKS

1. Measure 3 tablespoons of vegetable oil and put in frying pan.
2. Make sure bottom of pan is covered with oil.
3. Put frying pan on warm burner.
4. Turn burner on to medium.
5. When oil is hot, place fish sticks in pan carefully.
6. Turn fish sticks over with a spatula when bottoms are brown.
7. Brown on other side.
8. Take fish sticks out of frying pan with a spatula.
9. Turn burner to OFF.
10. Put fish sticks on a serving dish.
11. Serve with tartar sauce.

Specified sequential behaviors to prepare foods for dinner

Meats

MEAT LOAF

1. Turn oven on to 350°.
2. Crack one egg into a large mixing bowl.
3. Make sure no little pieces of eggshell get into bowl.
4. Throw eggshell into the garbage.
5. Measure 1/2 cup milk.
6. Add 1/2 cup milk to egg in mixing bowl.
7. Cut one onion in half.
8. Wrap one piece in foil and put in refrigerator.
9. Cut other piece into tiny pieces.
10. Put onion pieces in bowl with milk and egg.
11. Add a few shakes of catsup to bowl.
12. Break one pound of hamburger meat into little pieces using your clean fingers.
13. Add the hamburger to the bowl.
14. Mix well with fingers.
15. Add salt and pepper.
16. Put the mixture into a loaf pan.
17. Put pan into oven.
18. Set timer for one hour (60 minutes).
19. When buzzer rings, take meat loaf out of oven using hot pads.
20. Turn oven to OFF.
21. Cut meat loaf into slices and serve with catsup.

DINNER

HAMBURGERS

1. Take a small chunk of hamburger in your clean hands.
2. Make it flat.
3. Make it round.
4. Put the round and flat hamburger in a frying pan.
5. Put the frying pan on a burner.
6. Turn the burner on to HIGH.
7. Turn the hamburger when the bottom turns brown.
8. Brown the other side.
9. Salt and pepper.
10. Turn the burner to OFF.
11. Put hamburger on a hamburger roll.
12. Serve with catsup and mustard.

Other variations on hamburger:

Sloppy Joe

Spaghetti Sauce

Meatballs

Broiled Hamburgers

DINNER

BAKED CHICKEN

1. Turn oven on to 350°.
2. Wash chicken pieces under faucet with cool water.
3. Pat dry with a towel.
4. Cover baking pan with aluminum foil.
5. Place chicken pieces in baking pan.
6. Salt and pepper chicken pieces.
7. Put one pat of butter on each piece of chicken.
8. Put chicken in oven.
9. Set timer for 30 minutes.
10. When buzzer rings take chicken out of oven.
11. Using a hot pad lift one side of pan up. Make all the butter go to the other side.
12. Using a tablespoon, pour butter over chicken pieces.
13. When each piece of chicken is wet with butter, put pan in oven again.
14. Set timer for 30 minutes.
15. When buzzer rings take chicken out of oven using hot pads.
16. Turn oven to OFF.
17. Put on serving plate.
18. Serve.

DINNER

BROILED CHICKEN

1. Put broiler rack 6 inches from heat.
2. Wash chicken pieces with cool water under the water faucet.
3. Cover broiler pan with aluminum foil.
4. Brush chicken pieces with vegetable oil.
5. Put chicken pieces on broiler pan.
6. Salt and pepper chicken pieces.
7. Put pan in oven or broiler on broiling rack.
8. Turn broiler on.
9. Watch the chicken. When it is brown (about 20 minutes), take pan out of oven/broiler.
10. Turn the pieces over so that the uncooked side is up.
11. Put pan back in the oven/broiler.
12. Watch the chicken. When it gets brown take it out of the oven.
13. Turn broiler/oven to OFF.
14. Put it on a serving dish. Serve.

DINNER

BROILED PORK CHOPS - BROILED STEAK

1. Put broiler rack 6 inches from heat.
2. Cover broiler pan with aluminum foil.
3. Put pork chops on broiler pan.
4. Salt and pepper pork chops.
5. Put broiler pan in oven.
6. Turn broiler on.
7. Watch the pork chops - when they are brown (about 10 minutes) take pan out of oven.
8. Turn pork chops so that uncooked side is up.
9. Salt and pepper uncooked side of pork chops.
10. Put pan back in the oven.
11. Watch pork chops - when they are brown, remove pork chops.
12. Turn broiler to off.
13. Put pork chops on serving plate.
14. Serve.

DINNER

STEAK OR PORK CHOPS WITH CREAM OF MUSHROOM SOUP

1. Put pork chops in fry pan on burner.
2. Salt and pepper pork chops.
3. Turn burner on to medium heat.
4. After 10 minutes turn pork chops so brown side of chops is facing up.
5. Salt and pepper pork chops.
6. After 10 minutes remove fry pan from burner. Turn burner to OFF.
7. Turn oven on to 300°.
8. Place pork chops in casserole dish.
9. Open one can cream of mushroom soup.
10. Pour soup over pork chops.
11. Pour one can water over pork chops.
12. Stir water, soup, and chops.
13. Place covered casserole in oven.
14. Set timer for 30 minutes.
15. After 30 minutes, take casserole from oven.
16. Turn oven dial to OFF.
17. Put casserole dish on hot pad on table.
18. Serve.

SLICED FRIED HAM (1/2 inch thick)

1. Put 2 tablespoons vegetable oil in frying pan.
2. Put fry pan on burner.
3. Turn burner to medium heat.
4. After 5 minutes, turn ham with uncooked side facing down.
5. After 5 minutes, put ham on serving platter.
6. Serve.

VEGETABLES - FROZEN

1. Measure 1/2 cup water.
2. Pour water into a pan.
3. Measure 1/2 teaspoon salt.
4. Pour salt into pan. Stir.
5. Put pan on burner.
6. Turn burner on HIGH.
7. Heat to boiling.
8. Add frozen vegetable.
9. Cover the pan.
10. Heat to boiling.
11. When water boils, turn burner to LOW.
12. Cook 10 minutes or until a fork can be easily pushed into the vegetable.
13. Turn burner to OFF.
14. Put vegetable in a serving dish
15. Put a pat of butter on top.
16. Serve.

VE 'ETABLES - CANNED

1. Wipe top of can clean.
2. Open can.
3. Hold a saucer over open end of can to keep vegetable inside can.
4. Pour water from can into pan. Do not put vegetable in pan.
5. Put pan and vegetable water on burner.
6. Turn burner on to HIGH.
7. Heat water to boiling.
8. When water boils, add vegetable.
9. Salt and pepper the vegetable.
10. Add a pat of butter.
11. Heat until pat of butter melts.
12. Turn burner to OFF.
13. Put vegetable in serving dish. Serve.

VEGETABLES - FRESH

1. Wash vegetable.
2. Peel vegetable with vegetable peeler.
3. Cut vegetable into small pieces.
4. Fill a large pan half full with water from the sink.
5. Measure 2 teaspoons salt.
6. Pour salt into pan. Stir.
7. Put pan on burner.
8. Turn burner to HIGH.
9. When water boils add vegetable.
10. Boil vegetable and .er until a fork can be easily pushed into vegetable.
11. Turn burner to C
12. Put sieve in sink.
13. Pour water and vegetable into sieve.
14. Pour vegetable from sieve into a serving dish.
15. Put a pat of butter on vegetable.
16. Serve.

INSTANT MASKED POTATOES

1. Measure 1 1/2 cups water.
2. Pour 1 1/2 cups water into pan.
3. Measure 2 tablespoons butter.
4. Put butter into pan.
5. Measure 1/2 teaspoon salt.
6. Put salt into pan.
7. Put pan on burner.
8. Turn burner to MEDIUM.
9. Stir while cooking. Melt butter.
10. Measure 1/2 cup milk.
11. Pour milk into pan.
12. Stir.
13. Measure 1 1/2 cups potato flakes.
14. Pour potato flakes into pan.
15. Stir until potatoes are smooth.
16. Turn burner to OFF.
17. Put potatoes in a serving dish.
18. Serve with butter.

Desserts

INSTANT CHOCOLATE PUDDING

1. Open pudding box.
2. Put pudding mix in bowl.
3. Measure 2 cups of milk.
4. Pour milk into bowl.
5. Stir milk and pudding until smooth.
6. Put bowl in refrigerator.

JELL-O

1. Open jell-o box.
2. Put jell-o mix in bowl.
3. Measure 1 cup water.
4. Pour water into pan.
5. Put pan on burner.
6. Turn burner to HIGH.
7. Heat to boiling.
8. Turn burner to OFF.
9. Pour boiling water into bowl with jell-o.
10. Stir.
11. Measure 1 cup of cold water.
12. Pour cold water into bowl.
13. Stir.
14. Pour into jell-o mold or individual dishes.
15. Put in refrigerator until solid.

CHOCOLATE CUP CAKES ("JIFFY" CAKE MIX)

1. Turn oven on to 350°.
2. Open Jiffy cake mix box.
3. Pour cake mix into small bowl.
4. Break one egg on edge of bowl.
5. Add egg to bowl. Make sure no eggshell is in bowl.
6. Throw eggshell in garbage.
7. Measure 1/2 cup water.
8. Pour 1/2 cup water into bowl.
9. Put beaters in electric mixer.
10. Beat cake mix at HIGH speed for 4 minutes.
11. Scrape sides of bowl with rubber scraper.
12. Turn electric mixer to OFF.
13. Remove beaters. Scrape batter from beaters into the bowl.
14. Put paper baking cups into a muffin pan.
15. Fill each baking cup 1/2 full with cake mix.
16. Put muffin pans in oven.
17. Set timer for 25 minutes.
18. When timer rings, remove muffin pans from oven using hot pads.
19. Turn oven to OFF.
20. Let cupcakes cool. Remove them from pan.
21. Frost cupcakes.

CHOCOLATE CHIP COOKIES

1. Turn oven on to 350°.
2. Put one pat of butter or margarine on a small piece of aluminum foil.
3. Rub the butter on a cookie sheet until the sheet is greasy all over.
4. Put one stick softened butter or margarine in a mixing bowl.
5. Measure 1/2 cup white sugar.
6. Pour the sugar into the bowl.
7. Measure 1/4 cup brown sugar. Pack it into the cup.
8. Put the sugar in the bowl.
9. Break one egg on the edge of the bowl.
10. Drop the egg into the bowl.
11. Make sure no shell gets into the bowl. Put the shell in the garbage.
12. Measure 1 teaspoon vanilla. Add vanilla.
13. Put the beaters into the electric mixer.
14. Turn the electric mixer dial to MEDIUM.
15. Mix carefully.
16. Turn electric mixer to OFF.
17. Measure 1 cup flour.
18. Add flour to bowl.
19. Measure 1/2 teaspoon salt.
20. Add salt to bowl.
21. Measure 1/2 teaspoon baking soda.
22. Add baking soda to bowl.
23. Mix at MEDIUM speed with electric beater.
24. Turn beater to OFF when well mixed.
25. Take beaters off mixer. Scrape batter off beaters.
26. Add 1 package chocolate chips.
27. Mix batter and chips with a large spoon.

(continued)

CHOCOLATE CHIP COOKIES (con't.)

28. With a teaspoon, get a spoonful of batter.

29. Using another teaspoon, scrape the batter off onto the greased cookie sheet.

30. Make sure there is plenty of space between each cookie.

31. Put cookie sheet in oven.

32. Set timer for 15 minutes.

33. When buzzer rings, take cookie sheet out of oven with hot pads.

34. Remove cookies from cookie sheet with a wide spatula.

BUSY-DAY CAKE

1. Turn oven on to 375°.
2. Measure 1/3 cup shortening.
3. Put shortening in a mixing bowl.
4. Hold a sifter over the mixing bowl. Pour these things into the sifter and sift them.
5. 1 3/4 cups cake flour
6. 3/4 cup sugar
7. 2 1/2 teaspoons baking powder
8. 1/2 teaspoon salt.
9. Break one egg. Add egg to the bowl.
10. Make sure no shell gets into the bowl. Put the shell in the garbage.
11. Measure 3/4 cup milk.
12. Add the milk to the bowl.
13. Stir with a large spoon until everything is wet.
14. Put beaters in electric mixer.
15. Set bowl under beaters.
16. Turn dial to MEDIUM.
17. Beat for 2 minutes. Turn dial to OFF.
18. Measure 1 1/2 teaspoons vanilla.
19. Add vanilla to bowl.
20. Turn dial to MEDIUM.
21. Beat for 2 minutes.
22. Turn dial to OFF.
23. Put a dab of shortening on a small piece of aluminum foil.
24. Rub the shortening all over the inside bottom and sides of a 9 inch square cake pan.
25. Make sure all of the bottom and sides are greasy.
26. Put 2 tablespoons of flour in the pan.

(continued)

BUSY-DAY CAKE (con't.)

27. Shake the pan carefully. Make the flour cover all of the bottom and sides of the pan.

28. Pour the cake batter into the cake pan.

29. Put the cake pan in the oven.

30. Set the timer for 25 minutes.

31. When the timer rings, put a fork into the cake. If the fork tongs come out without crumbs, the cake is done.

32. If tongs are full of crumbs, let cake bake.

33. If tongs are clean, take cake out of oven with hot pads.

34. Let cool on a wire rack.

35. Cut into squares and serve on a serving plate.

PILLSBURY BANANA BREAD, CRANBERRY BREAD, NUT BREAD

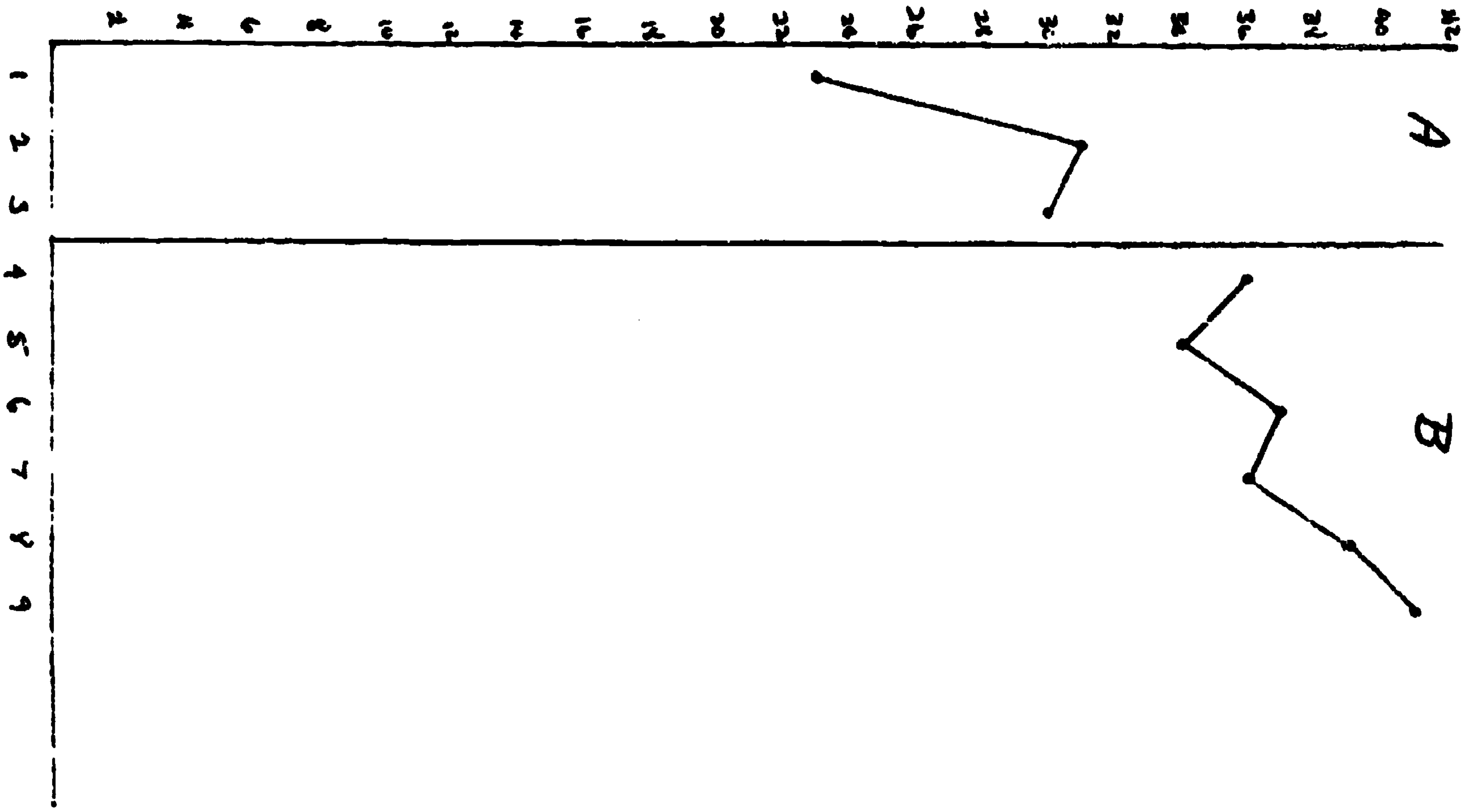
1. Turn oven to: 375° for Banana Bread

   350° for others

2. Tear off a small piece of aluminum foil.
3. Put a pat of butter on the foil.
4. Rub the foil on bottom and sides of a loaf pan.
5. Make sure bottom and sides of loaf pan are covered with butter.
6. Put 1 teaspoon full of flour in the pan and shake the pan.
7. Make sure bottom of pan is covered with flour.
8. Break one egg into a large mixing bowl.
9. Measure 1 cup water.
10. Add water and stir.
11. Open bread mix box.
12. Add bread mix to bowl.
13. Stir until moist.
14. Put in oven.
15. Set timer for 50 minutes.
16. When timer rings, take bread out of oven.

Housekeeping. Six housekeeping skills have been taught to date: dishwashing, dusting, floor-vacuuming, table setting, bed making, and bed changing. In each case, object identification was first developed; then the skill was taught using either a series of verbal directions, a stimulus fading procedure, or a series of performance criteria.

Teaching students to identify housekeeping objects. Procedures which taught or verified the existence of object identification skills were the initial parts of the teaching of all five housekeeping skills. Quantitative acquisition records are available for six students who were taught to label 7 objects involved in bed making. Criterion performance was 2 consecutive trials with more than 90% correct. Teaching procedures used were similar to those used by Brown, Jones, Troccolo, Heiser and Bellamy (1971). A sample data sheet and a frequency polygon showing correct labeling responses follows:



NUMBER OF CORRECT LABELING RESPONSES TO BEDMAKING OBJECTS DURING A) BASELINE AND B) TEACHING.

Date ________

Verbal Identification

	David	Debbie	Terry	Glen	Lynnete	Dale	Kathy
mattress pad							
bottom sheet							
top sheet							
pillow							
pillowcase							
spread							
blanket							
Total							

Teaching students housekeeping skills using verbal directions. Dish washing, floor vacuuming, and dusting were taught using a sequence of verbal directions. Teaching procedures described by Brown, Bellamy, Tang and Klemme (1971) and Brown, Bellamy, Perlmutter, Sackowitz and Sontag (1971) were used to teach the following verbal directions in sequence and then to maintain desired responding as verbal directions were systematically faded. The following verbal directions were used:

Dish Washing

Required 4 people: washer, rinser, dryers

Dish Washer

1. Stack all dirty dishes on right side of sink.
2. Clean out sink.
3. Put plug in sink.
4. Shake a small amount of dish washing detergent into sink.
5. Fill sink with hot water.
6. Put each dish in hot water.
7. Wipe all over with dish cloth until clean.
8. Put each dish into rinse water.
9. When all dishes are done, lift plug, let out water.
10. Clean out sink and drain board with cleanser.
11. Rinse sink.

Rinser

1. Clean out sink on the left.
2. Put plug in.
3. Fill sink ith hot water.
4. Rinse each dish carefully until it is not soapy.
5. Give dirty dishes back to washer.
6. After dish is rinsed put it on draining rack.
7. When all dishes are rinsed, pull plug, let water out and clean sink.

Dish Dryers

1. Get a clean dish towel.
2. Wipe each rinsed dish in draining rack.
3. Put dry dishes to rinser.
4. Return soapy dishes to rinser.
5. When all dishes are dried, hang dish towel in correct place.
6. Put dishes in correct place on shelf.

Floor Vacuuming - Cannister Type

1. Obtain vacuum cleaner from storage place.
2. Unwrap cord.
3. Place plug in socket.
4. Put the correct piece on the end of the tube - i.e. the rug cleaning attachment.
5. Turn the vacuum cleaner on.
6. Start vacuuming the rug on the top left hand side, moving to the right.
7. Push the vacuum cleaner back and forth three times before moving to the right.
8. Move to the right and push the vacuum back and forth three times.
9. Continue step 8 until the width of the rug has been cleaned.
10. Move back two feet and vacuum strip three times before moving to the left.
11. Continue step 10 until the width of the rug has been vacuumed.
12. Repeat steps 8 and 9.
13. Continue steps 8-11
14. Turn vacuum off.
15. Pull plug from socket with hand on plug.
16. Wrap cord around vacuum or pull cord so it snaps into the vacuum.
17. Place vacuum in storage place.

Dusting Night Stand

1. Obtain small soft cloth from drawer.
2. Spray dusting cleaner on top of table.
3. Wipe surface of night stand until surface is shiny.
4. Turn cloth to unused side.
5. Spray dusting polishing cleaner on bottom of table.
6. Wipe surface of night stand until surface is shiny.
7. Dispose of cloth in laundry basket.
8. Return cleaner to storage closet.

Teaching [illegible] using a stimulus fading procedure. Table setting was [illegible] desired behaviors with the use of marked [illegible] thereby provided. The procedure is [illegible]:

Method for Teaching Table Setting

Terminal Objective - child will be able to set a table correctly consisting of the following items:

1. Plate
2. Knife
3. Spoon
4. Fork
5. Napkin
6. Cup
7. Saucer
8. Glass

Objective 1 - Child will be able to verbally label each of the above 8 items.

Procedure 1

Have students sitting around a large table with the 8 items displayed in front of teacher. Teacher should pick up first item (plate) and say, "Tom, what is this?" If the child responds correctly, reply, "Great, Tom, this is a plate." Follow this by having the rest of the students clap for Tom.

If the child does not reply correctly respond by saying, "No Tom, this is not a saucer, this is a plate." "Now, Tom, what is this?" If child replies correctly respond by saying, "Good, Tom, this is a plate." Do not encourage other students to clap for him.

Continue this procedure until each student has had an opportunity to respond to each item.

Data should be kept on each child's first response to the item. Do not record corrected responses of child.

Sample Data Sheet Day 1

	S_1	S_2	S_3	S_4	S_5	S_6	S_7	S_8
Plate	+							
Knife	-	-						
Spoon		+	+					
Fork				-				
Napkin					-			
Cup						+		
Saucer							-	
Glass								+

Criterion - When entire grid is filled with + marks (indicating correct responses) students are ready to progress to objective 2.

Objective 2 - Child will be able to place the 8 items on a construction paper placemat with the 8 items stenciled on the placemat in three minutes.

Procedure 2

Give each student a set of the 8 items and tell him to match and place the items on his placemat. The students should be given three minutes to complete the assignment. At the end of the three minutes, check each student's placemat with the other students watching. Check each of the items and have the group clap for each correctly placed item.

If the item is not correctly placed, say, "Tom, try another place for this item." If child does not respond correctly, say "Tom, put the plate next to the fork."

Data again should be kept on each student's responses. An individual data sheet should be kept as opposed to a group data sheet.

Sample Data Sheet 2

Name

	Day 1	Day 2	Day 3	Day 4
Plate				
Knife				
Spoon				
Fork				
Napkin				
Cup				
Saucer				
Glass				

Criterion - When student's individual data sheet is filled with + (correct responses, child is ready to move to objective 3.

Objective 3 - Child will be able to set a table correctly in three minutes on construction paper placemat with no stenciled patterns to follow, given the 8 items.

Procedure 3

Teacher again makes each child a placemat; however, one item will not be drawn, i.e. plate is not stenciled. Students are instructed to correctly place the items on the placemat. Time limit again is 3 minutes.

At the end of 3 minutes, teacher checks each child's placemat with the rest of the students observing. Students should clap for each correctly placed item. If any item is misplaced teacher should say, "Try another way."

After the child completes the objective of placing the item which has not been drawn on the placemat, the teacher should make a new placemat with another item not stenciled on it. Then stenciled items should be removed in the following order.

1. Plate
2. Knife
3. Spoon
4. Fork
5. Napkin
6. Cup
7. Saucer
8. Class

Individual data should be kept on each response. See Data Sheet 2 -

If item is not stenciled in, a check should be placed in front of item.

Criterion - When student's individual data sheet is filled with + (correct responses) and no items are stenciled on the placemat, the child is ready to have the placemat removed.

Teaching students housekeeping skills using a sequence of performance criteria. The bed making and bed changing training projects conducted during the summer prevocational program allowed for the development of measurement techniques which now seem applicable to a variety of home living teaching programs. In this teaching approach, a student is given a general directions, e.g., "Make the bed." His subsequent performance is evaluated according to order and quality criteria. If a response is unsatisfactory, help is given as needed so that the student can meet the criteria for that task and thus have the opportunity to complete the next task in the sequence. Measures of a student's ability to complete each task in the sequence thus can be attained easily in one setting. Material provided below describes the task sequences in the bed making and bed changing programs and includes graphs of individual performances across trials.

BED-CHANGING PROGRAM

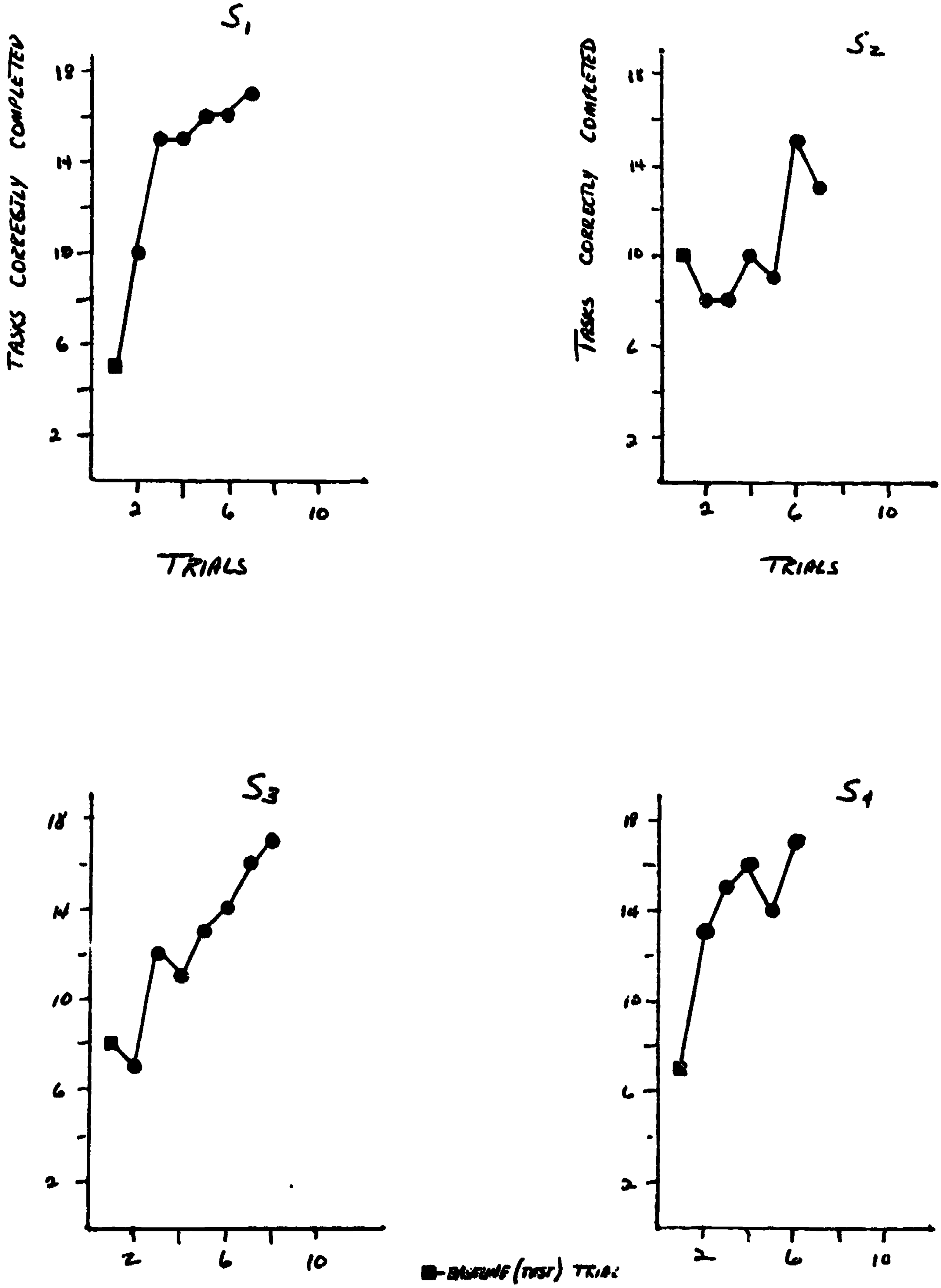
TASK NO.	TASK	ERRORS (& Criteria)	Procedures after error occurs (first record error)
I.	Place all bedding on the table by bed.	ORDER: (S begins another task before bed is clear) PERFORMANCE: (Bedding placed on floor, etc.)	A. NON-PUNITIVE INDICATION OF ERROR: "Try another way" "Try something else;" "What do you do now?" B. VERBAL DIRECTION: "Place all bedding on the table by the bed." C. MODEL: T performs task, points to finished situat , returns bedding to where S left it, motions to S and says: "Now you do it". (do not repeat verbal direction here). D. PRIME: T guides S thru task, then tell and motion to S, "Now you do it". (Note that C & D are primarily non-verbal procedures.)
II.	Put the pad on the mattress.	ORDER: S does another task or gets wrong piece of bedding. PERFORMANCE: Pad not on lengthwise with bed.	A. INDICATION OF ERROR: "Try another way"; "What do you do now"; "Try something else". B. VERBAL DIRECTION: "Put the pad on the mattress." C. MODEL D. PRIME
III.	Fit all 4 corners of the pad to the mattress.	ORDER: S begins another task, etc. PERFORMANCE: 4 corners not fitted.	A. INDICATION OF ERROR (as above) B. VERBAL DIRECTION: "Fit all 4 corners of the pad to the mattress." C. MODEL D. PRIME

TASK NO.	TASK	ERRORS (& Criteria)	Procedures after error occurs (first record error)
IV.	Put the fitted sheet on the mattress.	ORDER: Another item put on bed, etc. PERFORMANCE: Sheet on lengthwise with bed. (right side up??)	A. INDICATION OF ERROR (as above) B. VERBAL DIRECTION: "Put the fitted sheet on the mattress". C. MODEL D. PRIME
V.	Fit all 4 corners of the sheet to the mattress.	ORDER: Another task begun, etc. PERFORMANCE: 4 corners not fitted.	A. INDICATION OF ERROR B. VERBAL DIRECTION C. MODEL D. PRIME
VI.	Tuck sides of mattress pad and fitted sheet under mattress.	ORDER: Another task begun, etc. PERFORMANCE: Sides not tucked.	A. B. C. D. (AS ABOVE)
VII.	Place the top sheet on the mattress.	ORDER: Another item, etc. PERFORMANCE: Sheet must be on 1) right side up; 2) lengthwise with mattress; 3) with wide hem at head of bed, 4) sides even-smooth.	A. B. C. D. (AS ABOVE)
VIII.	Pull down and smooth.	ORDER: Another item, etc. PERFORMANCE: Not smooth.	A. B. C. D. (AS ABOVE)

BEST COPY AVAILABLE

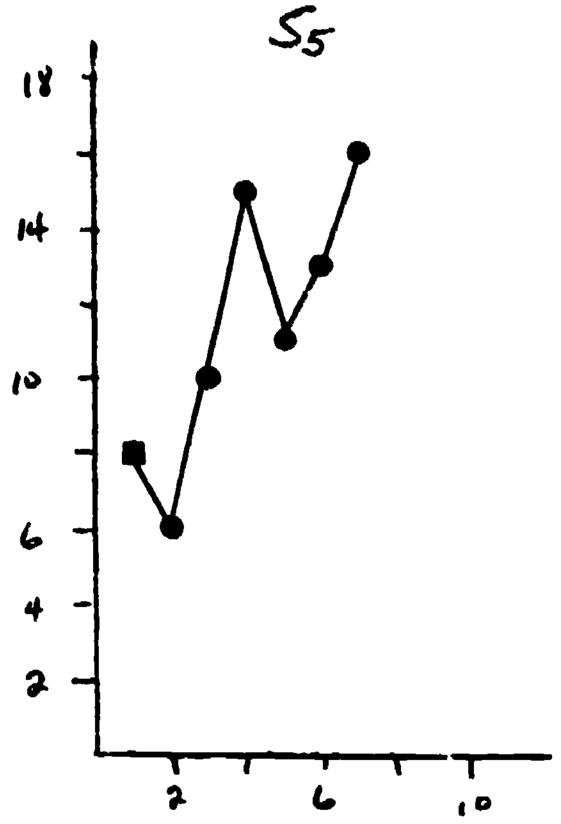
TASK NO.	TASK	ERRORS (& Criteria)		Procedures after error occurs (first record error)
IX.	Tuck the bottom of the sheet under the foot of the mattress.	ORDER: Another item; task PERFORMANCE: Tuck uneven or undone.	A. B. C. D.	(AS ABOVE)
X.	Put the blanket on the bed.	ORDER: As above. PERFORMANCE: 1) on lengthwise with mattress. 2) sides even. 3) smooth.	A. B. C. D.	(AS ABOVE)
XI.	Pull down and smooth.	ORDER: As above. PERFORMANCE: Not smooth.	A. B. C. D.	(AS ABOVE)
XII.	Tuck the bottom of the blanket under foot of mattress.	ORDER: As above. PERFORMANCE: Uneven or undone.	A. B. C. D.	(AS ABOVE)
XIII.	Put the bedspread on the bed.	ORDER: As above. PERFORMANCE: 1) sides even 2) lengthwise on bed 3) top at head of bed.	A. B. C. D.	(AS ABOVE)
XIV.	Turn the bedspread down.	ORDER: As above. PERFORMANCE: 1) uneven 2) too much or not enough	A. B. C. D.	(AS ABOVE)

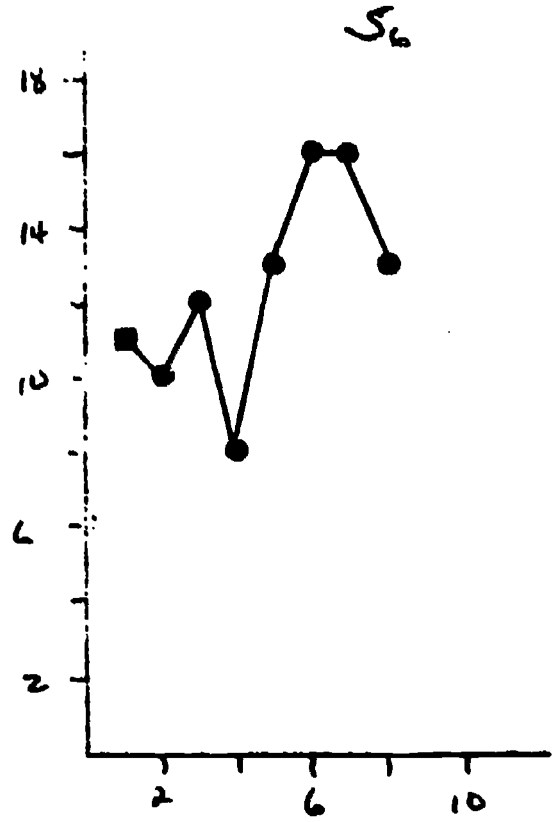
TASK NO.	TASK	ERRORS (& Criteria)	Procedures after error occurs (first record error)
XV.	Put the pillow case on pillow.	ORDER: As above. PERFORMANCE: 1) seam of case at sides of pillow.	A. B. C. D. (AS ABOVE)
XVI.	Put the pillow on the bed.	ORDER: As above. PERFORMANCE: Pillow at head of bed, in center.	A. B. C. D. (AS ABOVE)
XVII.	Pull the bedspread over pillow.	ORDER: As above. PERFORMANCE: 1) seam below pillow. 2) pillow covered	A. B. C. D. (AS ABOVE)
XVIII.	Brush over top of bed to smooth.	ORDER: Forgets, etc. PERFORMANCE: Not smooth enough.	A. B. C. D. (AS ABOVE)

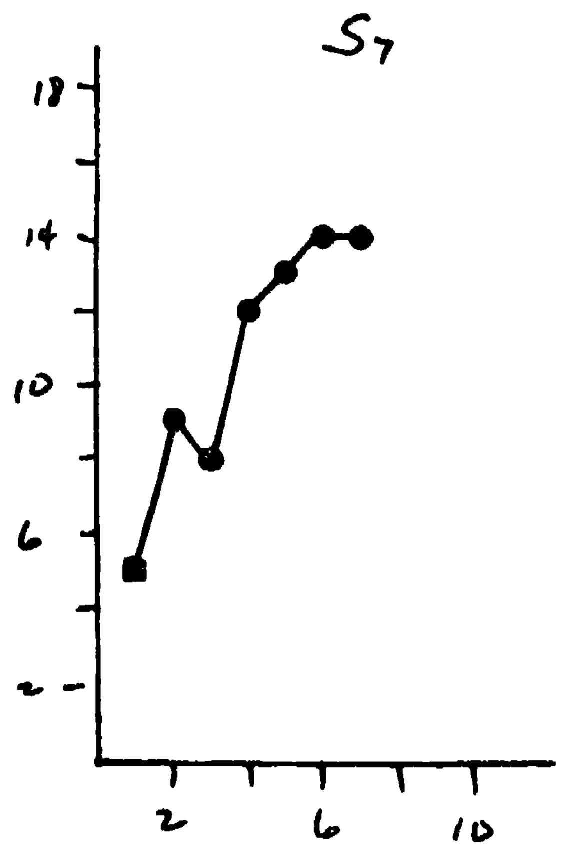


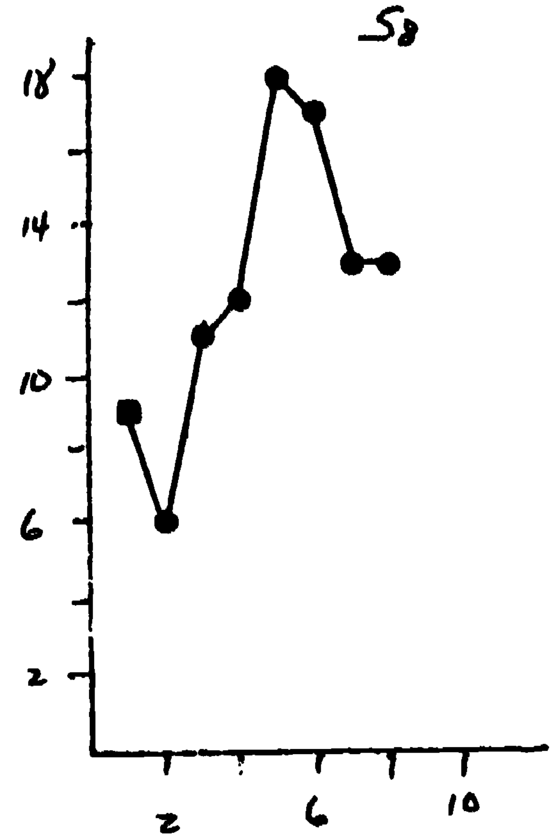
■ - BASELINE (TEST) TRIAL

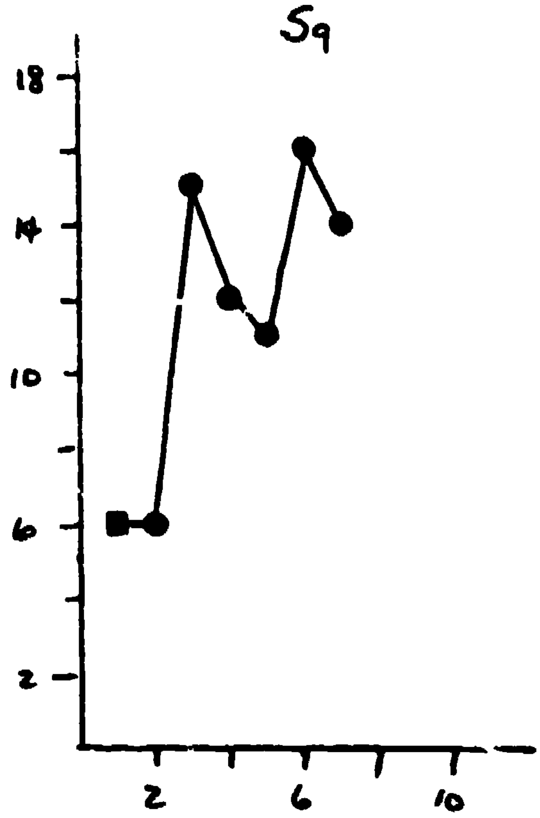
● - TEACHING TRIAL

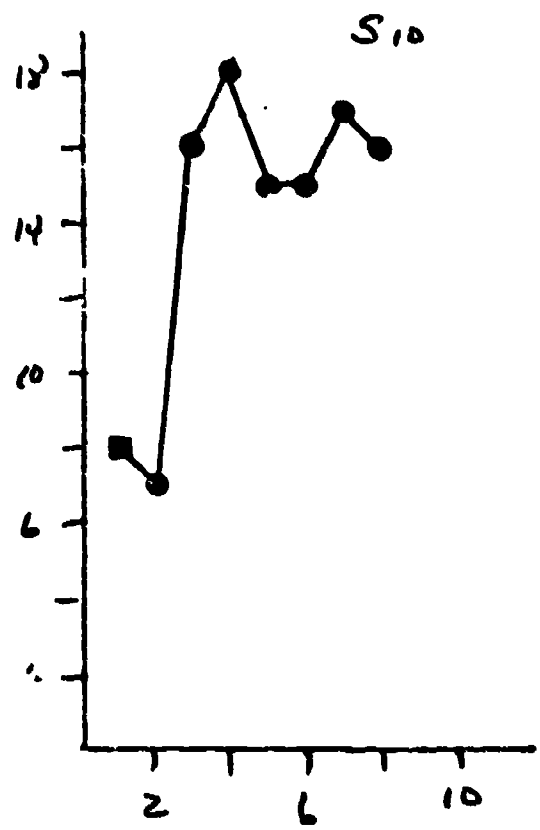

S5
18
14
10
6
4
2
2
6
10

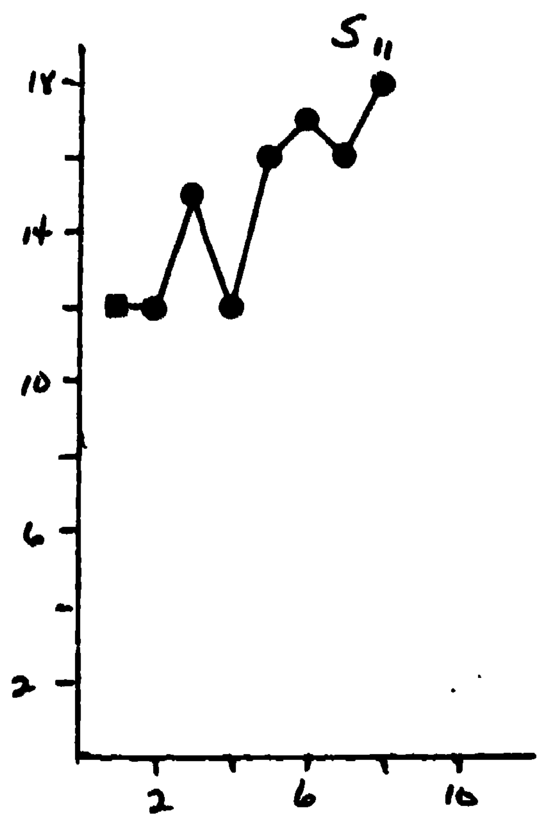

S6
18
14
10
6
2
2
6
10

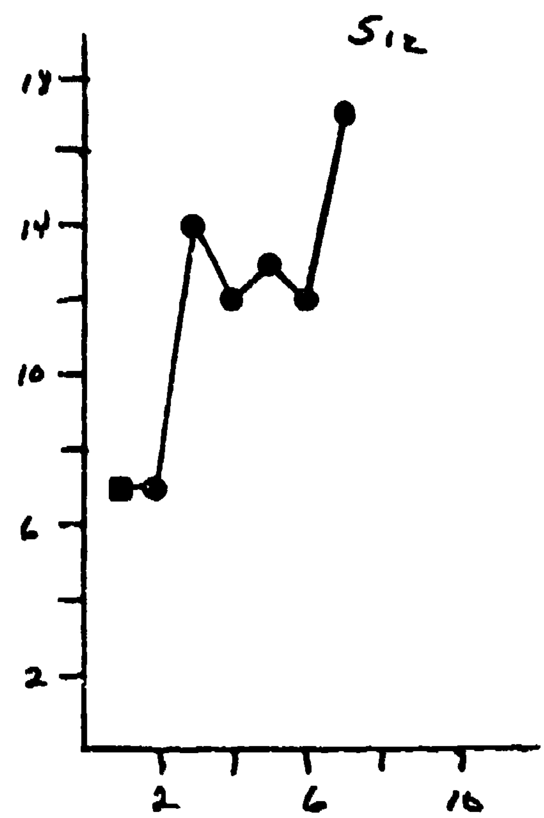

S7
18
14
10
6
2
2
6
10

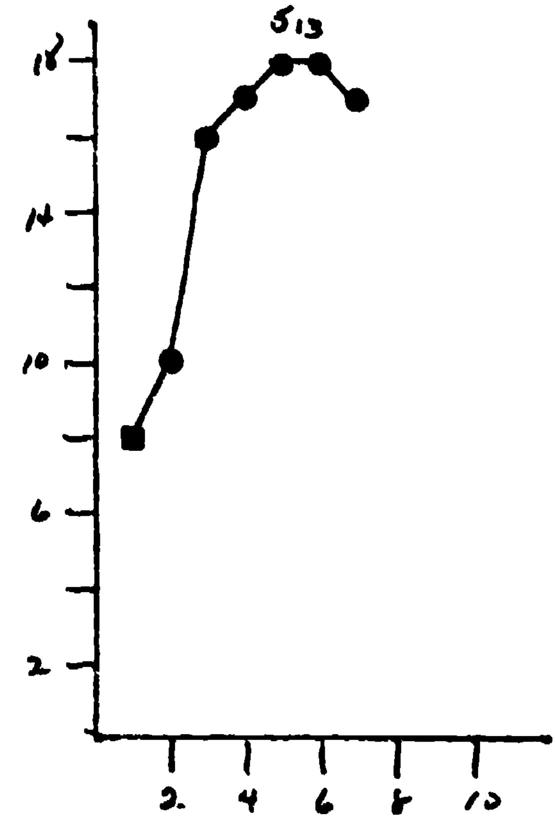

S8
18
14
10
6
2
2
6
10

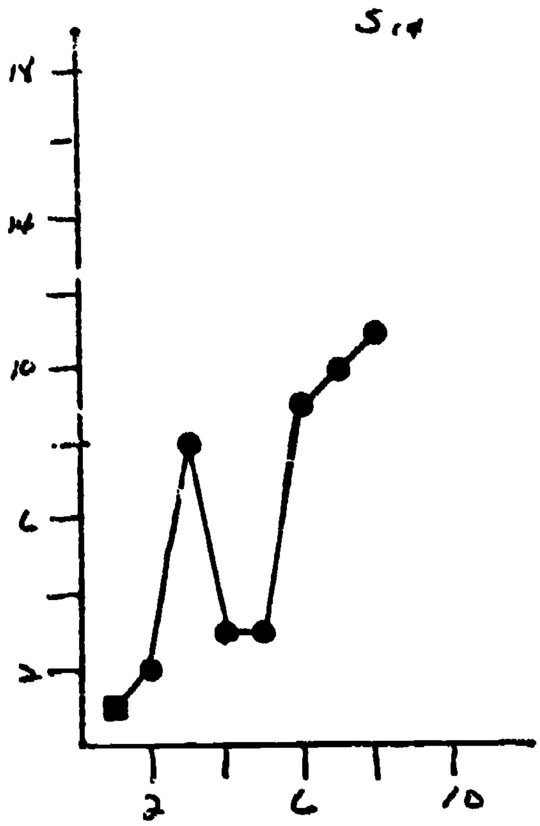

S9
18
14
10
6
2
2
6
10

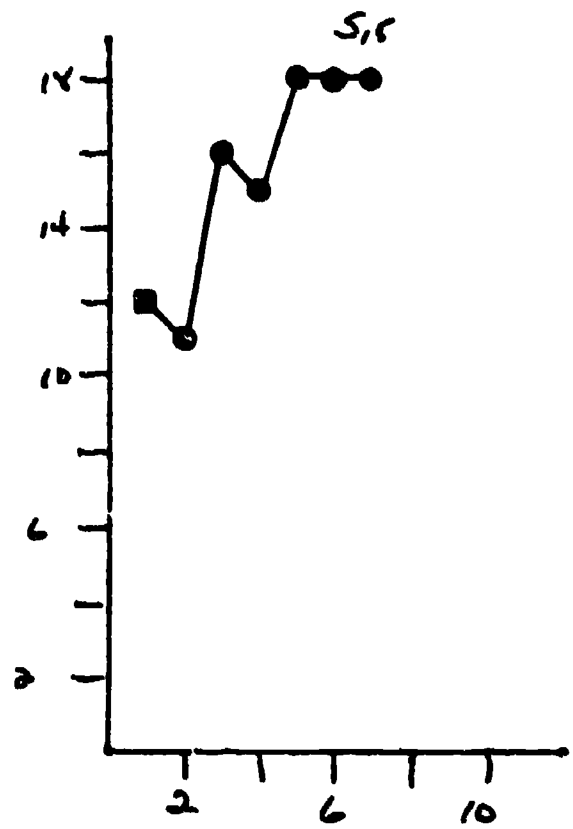

S10
18
14
10
6
2
6
10

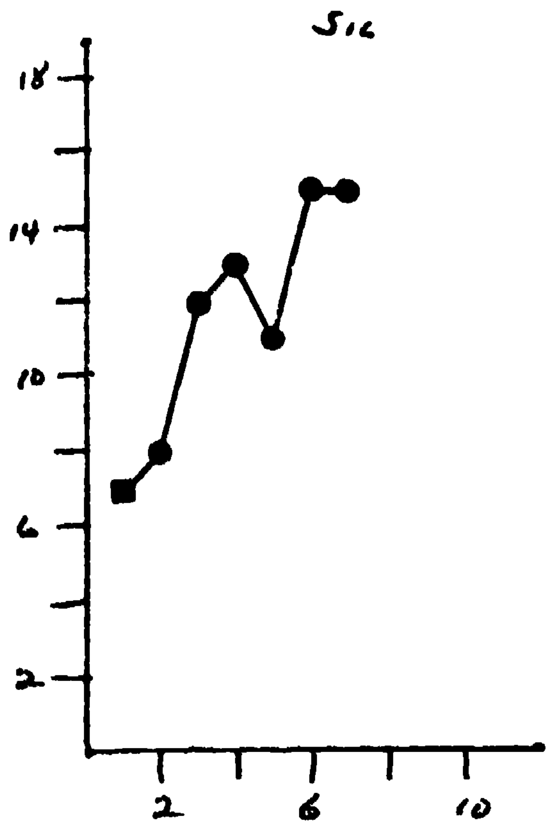

S11
18
14
10
6
2
2
6
10


S12
18
14
10
6
2
2
6
10


S13
18
14
10
6
2
2
4
6
8
10


S14
18
14
10
6
2
2
6
10

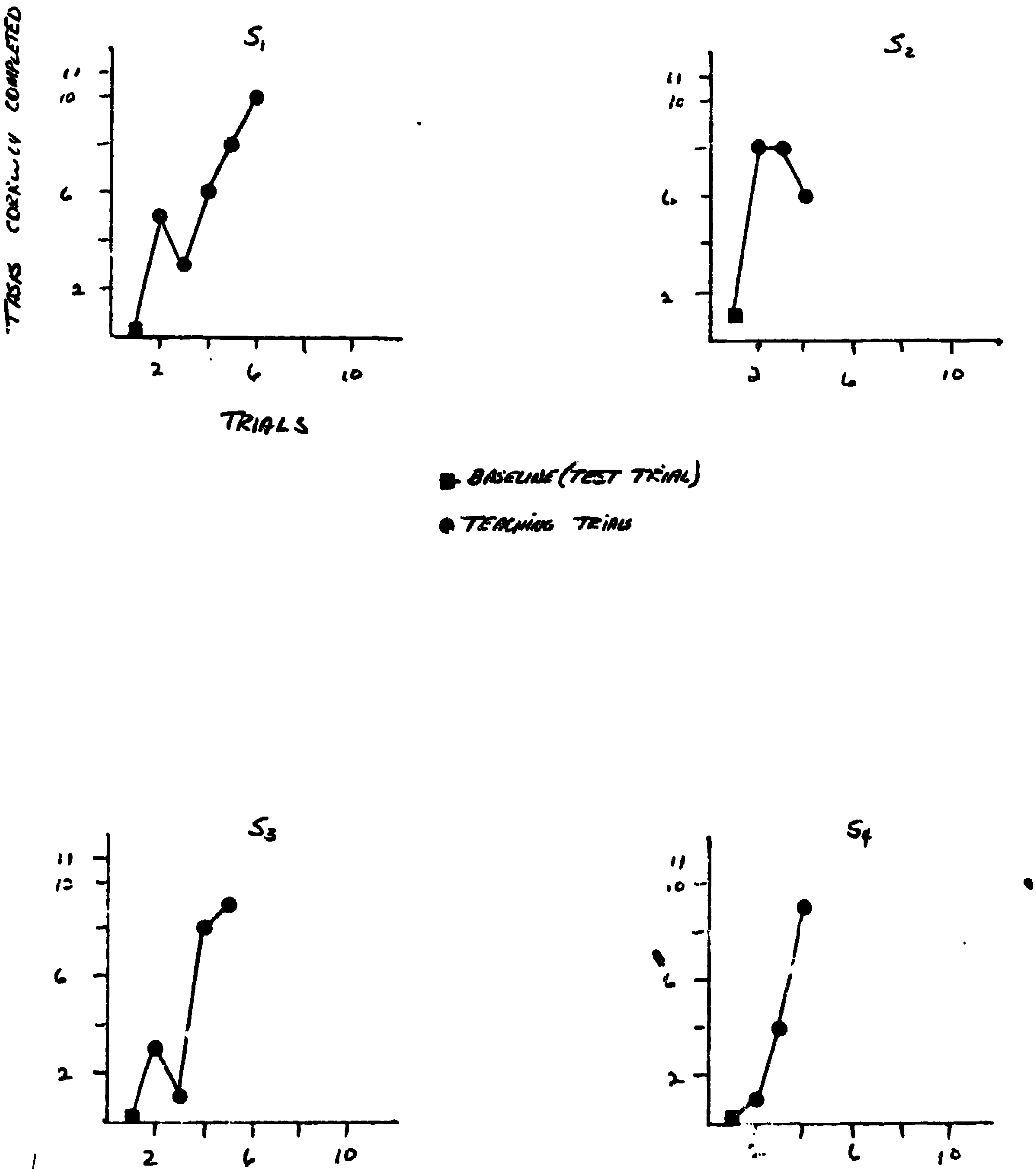

S15
18
14
10
6
2
2
6
10


S16
18
14
10
6
2
2
6
10

Bed-making Program

The bed-making program involved procedures identical to those used in the bed-changing program. The following task sequence was used:

1. Take pillow off bed.
2. Smooth bottom sheet.
3. Pull up top sheet.
4. Pull blanket up.
5. Tuck bottom corners of sheet and blanket.
6. Pull spread up.
7. Smooth bedspread.
8. Turn down spread.
9. Put pillow on bed.
10. Put spread over pillow.
11. Smooth bedspread.


S1
S2
S3
S4
TASKS CORRECTLY COMPLETED
TRIALS
BASELINE (TEST TRIAL)
TEACHING TRIALS

Laundry. Selected skills involved in laundry chores were taught by 1) developing object identification skills and 2) teaching behaviors involved by using verbal directions, then maintaining required behaviors while the directions are systematically faded. The following skills were taught:

Laundry

a) Washing Clothes

1. Washing Machine
2. Hand Wash

b) Drying Clothes

1. Outside
2. Dryer

c) Folding Clothes

1. Flat
2. Hanging things on hangers.

d) Ironing Clothes

1. Flat
2. Difficult

Clothes Washing

1. Look at all the dirty clothes.
2. Sort clothes into 4 piles.
   a. white and bleachable
   b. white and unbleachable
   c. light
   d. dark
3. Make sure washing machine is empty and clean.
4. Put the white bleachable clothes in washer.
5. Measure 1 cup laundry detergent.
6. Pour laundry detergent on clothes in machine.

7. Set dials.

8. Start washing machine by turning dial to correct setting and pushing dial in.

9. When washing machine is filled with water, measure 1 cup bleach.

10. Pour bleach into bleach hole.

11. Close door of washing machine.

12. Wash is done when dial is at marker: OFF.

Skip Steps 9 and 10 for non-bleach loads.

Clothes Drying

1. Open dryer door.
2. Empty lint from lint filter.
3. Make sure all dry clothes are out of dryer.
4. Put clean wet clothes from washing machine into dryer. Close door.
5. Set dial on 60 minutes.
6. Push yellow button once.
7. Set regular timer for 10 minutes.
8. When timer rings, check all stay-press clothes. If damp, take out of dryer and hang on hangers.
9. When other clothes are dry, take them out of dryer.
10. Hang up all clothing that belongs on a hanger: shirts, blouses, dresses, skirts, trousers.
11. Put sock pairs together.
12. Fold t-shirts, towels, etc.

Folding Clothes

A. Flat - Towels-Wash Clothes

1. Lay clothes flat on folding table.
2. Smooth.
3. Fold in half by bringing top of fabric down to bottom of fabric-length.

4. Continue steps 2 and 3.

5. Fold in half by bringing one side of fabric to meet other side of fabric.

6. Continue until fabric is in storable size.

7. Place folded article on table.

B. Flat - T-shirts

1. Lay T-shirt on table with back of T-shirt facing up.

2. Bring left side of T-shirt to middle of T-shirt.

3. Bring right side of T-shirt to middle of T-shirt. Fold.

4. Bring bottom half of T-shirt to middle of T-shirt. Fold.

5. Bring folded half of T-shirt to the top of T-shirt. Fold.

6. Place folded article on table.

Ironing Clothes

A. Use of Iron and Safety of Iron

1. Stand iron in upright position.

2. Plug iron in wall socket.

3. Turn iron to medium heat.

4. Return iron to upright position each time iron is taken off fabric.

5. If steam is used, fill iron with water with some type of container with spout.

6. When water is in, turn iron to steam position.

7. After ironing, return iron to upright position, turn iron off.

8. Pull plug out of wall socket.

9. Take iron off of ironing board, place on non-burnable counter top in upright position.

10. When iron is cooled, (2 hours), empty water from iron.

11. Wrap cord around iron.

12. Place in storage cabinet.

B. Ironing flat objects

1. Handkerchiefs

   a) Place handkerchief on board.

   b) Iron fabric.

   c) Fold fabric in half.

   d) Iron

   e) Fold fabric in half.

   f) Iron

   g) Place handkerchief on table.

2. Pillow Cases

   a) Place pillow case on board with seamed top of case on board to iron first.

   b) Iron-making sure seams are flat.

   c) Bring unironed fabric over board.

   d) Ironing.

   e) Repeat until case is ironed.

   f) Turn case over.

   g) Repeat steps a-e.

   h) Fold case in half - lengthwise.

   i) Iron.

   j) Fold case in half - lengthwise.

   k) Iron.

   l) Fold case in half - widthwise.

   m) Place ironed case on table.

3. Shirt or blouse.

   a) Place collar of fabric on board.

   b) Iron.

   c) Place doubled sleeves of fabric on board.

d) Smooth fabric - making sure crease will be on seam of sleeve.

e) Iron.

f) Place front opening of fabric on board (button hole side.)

g) Iron strip of fabric.

h) Place front opening of outside fabric on board (button side.)

i) Iron fabric around buttons - do not place iron on buttons.

j) Place fabric on board (front of shirt.)

k) Iron.

l) Move fabric (lengthwise) to continue ironing.

m) Repeat steps j-k, until all fabric is ironed.

n) Place shoulders of fabric on board - single thickness.

o) Iron.

p) Place shirt on hanger.

q) Button top button.

r) Place shirt on rack.

Part IV

DEVELOPMENT OF FUNCTIONAL ACADEMIC SKILLS

Introduction

Community vocational adjustment and domestic adequacy require the application of academic skills in a variety of settings. Historically, retarded and emotionally disturbed students, especially those considered trainable, have acquired these skills only with difficulty in the classroom and have applied them sparsely, if at all, in other settings. The failure of these students to progress satisfactorily or to make practical use of their abilities generally has occasioned inferences of intellectual inadequacies or impaired mental processes. The logic of this approach is appealing, but its utility is not. These students are in the public schools. If continued community functioning is expected when they leave school, means to impart the necessary skills must be devised. Thus, the ingenuity of the teacher and the effectiveness of her techniques, rather than the intellectual deficiencies of her students, are of basic practical concern. The purpose of academic instruction in this program is to identify and implement teaching procedures that are successful in developing the functional skills which seem prerequisite to success in vocational, domestic, social and recreational settings.

To date, instruction has been provided in selected reading, arithmetic and language skills. Skills selected have been identified as classroom difficulties by the teachers or have been suggested by obvious discrepancies between the actual behaviors of the students and that required for community functioning. Certainly, the instructional programs presented here are not sufficient to develop an adequate repertoire of academic skills. Nor have all students in the prevocational training programs been included in each of the instructional programs. The procedures presented here do suggest, however, that an effective teaching technology is being developed. It is now incumbent on the teaching staff to utilize established procedures to develop basic academic skills as early as possible in the schooling of retarded and disturbed students. If this is accomplished, more complex vocational, domestic, social and recreational skills may be developed later. The procedures described below that have been used successfully with young students therefore seem especially significant.

Reading papers

Functional reading skills are necessary if a student is to obey traffic regulations, use travel aids, locate merchandise sales, shop effectively, follow written instructions, use telephone directories, avoid dangerous and poisonous items, and benefit from newspapers and other published information. Reading instruction to date has involved the development of a sight word vocabulary in both individual and group settings (Brown, Hermanson and Ora, 1970; Brown, Klemme, Haubrich and Ora, 1970;) the use of trainable student as a reading instructor (Brown, Fenrick and Klemme, 1971); the teaching of skills involved in reading and following written directions (Brown and Perlmutter, 1971) and the development in young trainable students of verbal and nonverbal responses to printed words (Brown, Jones, Trocolo, Heiser and Bellamy, 1971). Reports of these teaching programs follow:

TEACHING A "TRAINABLE LEVEL" STUDENT BASIC SIGHT VOCABULARY[1]

Lou Brown, Jerry Hermanson
University of Wisconsin
John P. Ora
George Peabody College

Curricula for "trainable level" retarded students are frequently restricted to, or place major emphasis on, the development of basic social and recreational skills. One assumption underlying such restriction and emphasis is that the inherent limitations of the students dictate circumscribed educational goals. In some instances, however, the limitations may not reside in the students, but in the instructional technology in use. Such technical limitations can frequently be eliminated by a consistent application of learning principles. In the present demonstration several empirical generalizations, or learning principles, found widely applicable in psychology laboratories were relied on in teaching a "trainable level" retarded student the rudiments of a basic sight vocabulary. The learning principles were modeling, contingent positive reinforcement, and learning set.

Briefly, modeling consists of a model's performing a particular behavior in the presence of an observer so that the observer's subsequent behavior becomes more similar to the behavior of the model (Flanders, 1968). In the present demonstration, a teacher aide (TA) functioned as a model for the student so that the student could match the desired behavior.

Contingent positive reinforcement consists of presenting, immediately after a person has completed a stipulated behavior, a consequence which increases the rate of that behavior. In this demonstration contingent positive reinforcement was provided at first if the student matched the behavior of the TA, and later, if the student emitted a correct response without the aid of the model

Modeling and reinforcement were principles applied to teaching procedures. The third principle, learning set, was used in determining the feasibility of undertaking this demonstration.

Expectation of potential academic performance levels of "trainable level" students often may be unduly conservative because it is assumed that teaching a particular class of responses may require an inordinate amount of instructional time or practice. For example, if 50 training trials are required to teach a student to correctly label a single written stimulus, then it may require 50 training trials to teach each additional correct label. The psychological literature on learning shows that such assumptions are unwarranted. This demonstration relied on the overwhelmingly supported empirical generaliza-

[1]This demonstration was supported in part by NICHD Grant 5 P01 HD 03352-02 to the University of Wisconsin Center on Mental Retardation.

tion that the more organisms solve a particular type of problem, the more adept at arriving at solutions they become (Harlow, 1949, 1959; Kaufman & Prehm, 1966).

The empirical generalizations applied here are certainly not news to special education, but a premeditated reliance on them in daily classroom instruction is seldom encountered. The following demonstration exemplifies the educational outcomes that might be obtained by not only being familiar with basic learning principles, but implementing them consistently in practical education programs.

Method

Student. Hope Smith is a 12 year old female who was enrolled in a public school class for trainable level retarded students. A recent psychometric evaluation gave a WISC full scale IQ of 47. The recommendation of the examiner was that she be placed in a class for trainable level students emphasizing basic social and recreational skills. Brief informal observation showed that she spoke and seemed willing to engage in social interactions.

Materials. Fifty-seven words from the Sullivan Programmed Reading Book #1 (Sullivan & Associates, 1963) were printed on 4" x 6" yellow index cards. An 8-1/2" x 22" bar graph was placed on the wall of the classroom and every third number from 3 through 57 was printed on the graph.

Procedure

The 57 different words in the Sullivan Programmed text, numbered from 1 to 57 in the order in which they are introduced, were arranged in sets of three. During baseline, Hope was asked to label each word. If she correctly labeled the same word on three consecutive presentations, she was praised and that word was eliminated. If she did not correctly label a word in three consecutive presentations, that word was used in training.

The teaching procedures involved essentially three components: A) the TA presented a word and labeled it; B) the TA instructed Hope to match the label provided; C) the TA reinforced Hope when she matched the label. Had Hope ever failed to match a modeled word or engaged in extraneous activity, the TA would have ignored her briefly.

Training. All training was conducted by the TA in the school's music room during twenty-six 20-25 minute sessions.

The first word of a set was presented and the TA said, "Do you see this word?" (the TA pointed to the card and did not remove his finger until Hope looked at the card) "This word says _____. What does this word say?" When Hope matched the label, TA immediately smiled and made such statements as "good," "fine," "great job," "I am proud of you," and "you're learning to read." The TA then presented the second and third cards in the set and followed exactly the same modeling and reinforcement procedures as were used for the first word in the set.

When Hope had the opportunity to match the label of each word in the set, the TA presented the first word again and said, "What does this word say?" If Hope correctly labeled the word, the TA displayed approval and presented the next card in the set. If Hope did not label the word correctly, the TA modeled the correct label, asked Hope to match the modeled label, displayed approval when she did so, and presented the next word in the set. This procedure was followed until Hope correctly labeled the three words in the set on three consecutive presentations <u>without the modeling cues</u>. When she reached criterion on a set, the teacher colored the bar graph to reflect her progress and congratulated her in the presence of her classmates. The same procedure was used with all 17 sets.

After Hope reached criterion on each of the 17 sets, she was seated in the classroom at a circular table with her teacher and classmates, given the book from which the words were taken, and asked to read the first thirty pages of the book to her class. The TA followed her reading in a similar book and recorded errors.

Results and Discussion

The dependent variable was the number of errors made before Hope emitted nine consecutive correct responses to each set of three words. During the baseline tests, Hope demonstrated knowledge of 6 of the 57 different words in the text ("yes," "no," "I," "a," "the" and "ant"), labeling them correctly on three consecutive presentations. These six were eliminated. In no instance during baseline did she label one of the remaining 51 words correctly.

Insert Figure 1 about here

As shown in Figure 1, the combination of modeling and reinforcement procedures was sufficient to produce learning. Moreover, although there was some variability in performance, as expected Hope learned more efficiently as she progressed through the sets.

In the generalization test of reading to her classmates, the first time Hope read the first thirty pages of the text she made a total of twelve errors. (These errors were not corrected.) On the following day when she read the same pages, she made two errors. Thus, she read a total of 1200 words and made only 14 errors.

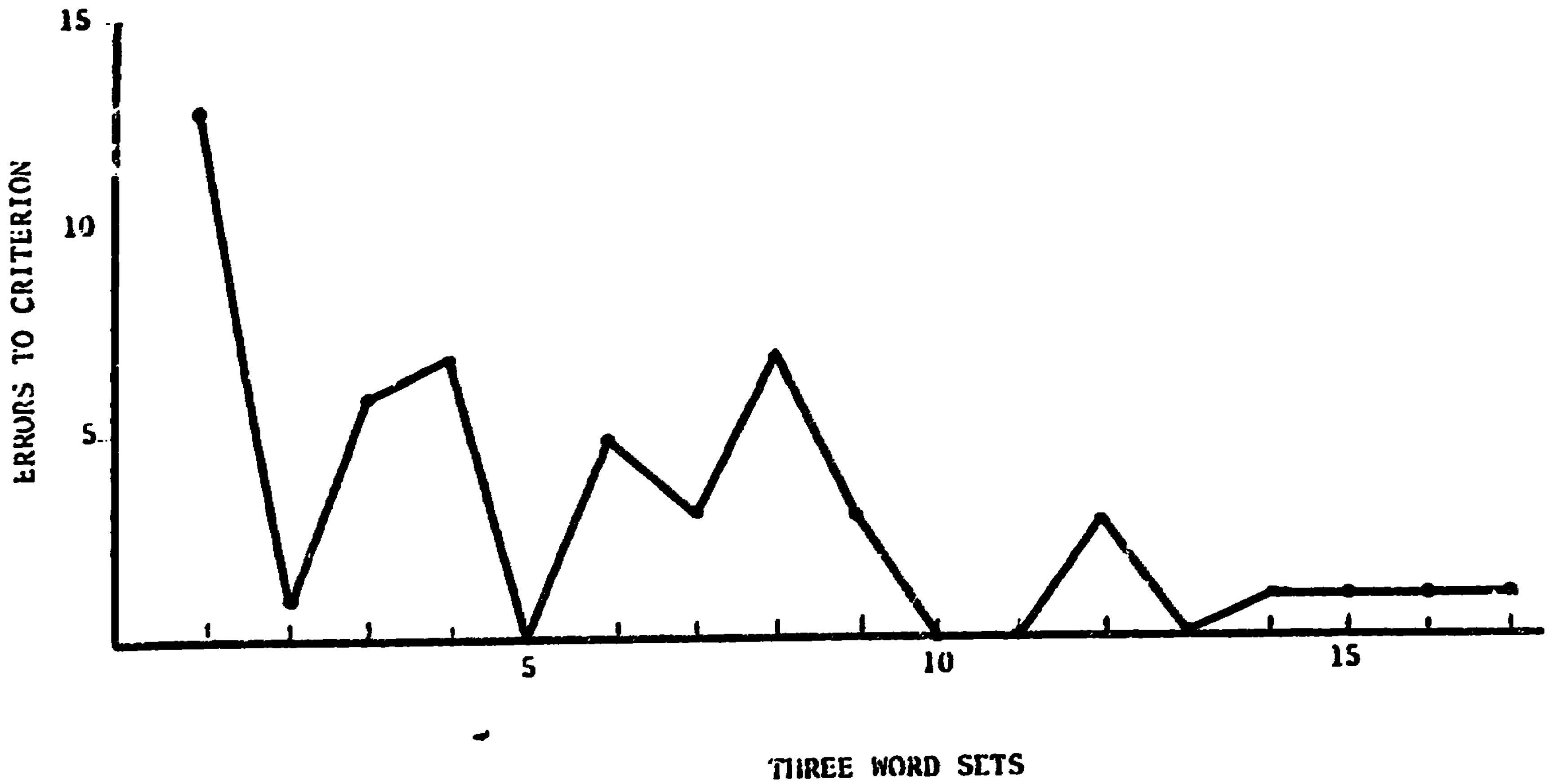
Once it had been demonstrated that Hope was capable of acquiring rudimentary reading skills, the question of what to do next arose. Continuing with a "whole word" approach or attempting to develop word attack skills (MacAulay, 1968) were alternatives considered. Fortunately, Hope's mother provided an answer. Hope had taken the textbook home with her and read it to her family. At a subsequent parent-teacher conference, Mrs. Smith expressed a desire to be able to leave Hope notes, because she was at her job when Hope returned from school. She agreed to give the teacher a list of words that might be used in these notes.

If Hope were assumed to be incapable of developing more than rudimentary social and recreational skills, teaching her to read her mother's notes would appear a formidable task. However, as the above demonstration suggests, it may be more constructive to assume that the deficits in her academic functioning have been due to the technology available to her in the past. Indeed, with a consistent reliance on learning principles, teaching her basic reading skills may not only be feasible, but also well within the competence of a teacher aide.

Figure 1 Number of errors to criterion on seventeen three-word sets.

Learning set

Figure 1



INDIVIDUAL AND GROUP INSTRUCTION WITH TRAINABLE LEVEL RETARDED STUDENTS[1]

Lou Brown, Hope Klemme, Paul Haubrich
University of Wisconsin
John P. Ora
George Peabody College

While the literature dealing with the education of trainable level retarded students places little emphasis on teaching basic academic subjects, it has been suggested that these students are capable of acquiring, and should be taught, a rudimentary sight vocabulary (Kirk & Johnson, 1951). Recently, a number of studies have demonstrated that individualized reading instruction utilizing basic learning principles established in psychology laboratories is a powerful method of teaching exceptional children (Birnbrauer, Wolf, Kidder & Tague, 1968; MacAulay, 1968; Shores, 1968; Staats & Butterfield, 1965). These studies typically involved a one-toone ratio between student and teacher. The direct generalization of their procedures to public school classrooms may be limited in that the typical classroom cannot afford such expenditures in time and in money for equipment. More economical methods must be developed to allow public school teachers to teach trainable level retarded students as effectively as is possible in laboratory settings.

One possible economical alternative may be to utilize a group instructional approach while maintaining the power of individual programming. Bandura (1969) suggested that some behaviors may be developed just as well in a group training situation as in an individual training situation, particularly if the members of a group are provided with the opportunity to observe their peers' behavior and its consequences.

To explore this suggestion, a teaching procedure suitable for both group and individual training would be needed. Brown, Hermanson, and Ora (1970) used such a procedure to teach a trainable level retarded student the rudiments of a basic sight vocabulary. They had a teacher aide model the correct responses and then contingently reinforced the stude for, at first, matching them and, later, initiating them. To adapt this procedure for groups required only the inclusion of a participant observer group during a portion of the training. Therefore, in the present demonstration, the procedures described by Brown et al. (1970) were applied to students in a group teaching situation as well as in a one-to-one teaching situation in order to examine the relative efficiency of the group teaching methods.

Method

Students. Students were trainable level retarded students enrolled in a midwestern public school system. They ranged in age from 12 to 14 and in IQ from 36 to 49. Additional diagnostic information included such labels as mongolism,

[1]This demonstration was supported in part by NICHD Grant 5 P01 HD 03352-02 to the University of Wisconsin Center on Mental Retardation.

brain damage, and mental retardation due to unknown prenatal influence. Six of the eight students in the class were used in the demonstration. Of the remaining students, one was admitted to a local hospital for a mastoid operation. The other demonstrated knowledge of 70% of the stimulus words during the baseline period and was put on a more advanced reading program.

Materials. Prior to the start of the demonstration, the teacher was asked to compile a list of words that she felt would be important for her students to learn to read. From this list she selected the ten words used in the demonstration. Five of the words ("go," "poison," "women," "don't," "left") were printed on 5x7 blue index cards and were used in individual training. The remaining five ("stop," "danger," "men," "not," "right") were printed on 5x7 yellow index cards and used for group training. M&M's, chocolate covered almonds, and salted peanuts were placed on a lunch tray and used as reinforcers.

Procedure

The design used in this demonstration was a modification of the "Multiple Baseline Design" (Baer, Wolf, & Risley, 1968) in which groups of students served as their own controls. The baseline data were obtained on two sets of words. The students were then taught to label one set of words in a one-to-one training situation and to label the other set of words in a group training situation. Using the same procedures, training on the words previously used in the individual situation was then completed in the group situation. Thus, the number of direct presentations and direct reinforcers was constant in both the individual and group training situations.

Baseline. During the baseline period, the class was assigned "seat work" while the teacher called one student at a time to the side of the room. When teacher and student were seated facing each other, the teacher presented each of the individual training cards and said, "What does this word say?" The teacher recorded the responses but did not provide feedback. When all five individual training cards had been presented, the student was returned to his desk and another student was tested on his knowledge of the individual training words.

When all six students were tested on their knowledge of the five individual training words, the same procedure was used to test their knowledge of the group training words. This procedure was followed for ten consecutive school days. Thus, each student was given ten opportunities to verbally demonstrate knowledge of each of the ten words used in the study.

Individual training. Individual training was conducted in the classroom by the teacher while the class was involved in "seat work" activities. The training program consisted of the following components:

1. Teacher and one student were seated facing each other at a desk.

2. Teacher presented one of the individual training words and asked, "What does this word say?"

3. If the student responded appropriately, the teacher said, "Good, now you may have one of the candies on the tray."

4. If the student did not respond appropriately, the teacher said, "No, this word says ______. What does this word say?" When the student only matched the behavior of the teacher he was not allowed to take a piece of candy from the tray, but the teacher followed his response with such statements as "good," "fine," and "great job."

This procedure was followed until each student had a chance to respond to each of the five individual training words.

Group training. During group training the six students (S1, S2, S3, S4, S5, S6) and the teacher were seated around a circular table in the front of the classroom. The group training program was identical to the individual program, with the one exception that the opportunity to respond was rotated among the children. That is, the teacher presented the second group training word to S2 and so forth until each S had one chance to respond to each of the five group training words.

Thus, under both the individual and group training conditions, each student had the opportunity to respond directly to five cards. However, under the group training procedure, each student was also provided indirect exposure in that he was allowed to observe the training of his peers.

Comprehension. When the students were able to correctly label each group of training words, the teacher then asked the students to indicate that they knew the meaning of the words. This consisted of asking such question as "What do you do when you see this word? What does this word mean? Show me what you do when you see this word." If they communicated to the teacher that they understood the "meaning" of the word, they were allowed to select a candy from the tray.

If the students could not answer the questions the teacher provided them with the answers, asked them to repeat the answers, and congratulated them.

Results and Discussion

The five individual training words and the five group training words were presented to each S during each of the 25 sessions. At any given session, the six Ss combined could make from 0 to 30 correct responses to each set of words.

Insert Figure 1 about here

Analysis with the Wilcoxon Matched Pairs Signed Ranks Test (Seigel, 1956) indicated a significant difference between correct responses to the individual training words and the group training words under the baseline conditions ($p < .01$). Figure 1 shows that correct responses to the individual training words were higher then correct responses to the group training words, providing an experimental bias in favor of the individual training condition.

Analysis of the effect of the training conditions indicated a significant difference between correct responses to the individual training words and the group training words under the training conditions (p .01). Figure 1 shows that correct responses to the group training words were higher than correct responses to the individual training words, despite the bias found when baseline comparisons were made. Moreover, individual and group training times were approximately the same ($\bar{X}$=12 minutes per session for group training and $\bar{X}$=11 minutes per session for individual training). As expected, correct responses to both sets of words improved significantly ($p<.01$) under the training conditions when compared to the baseline condition.

After session 20, individual training was discontinued and the individual training words were put under the group training condition. Figure 1 shows the marked increase in the number of correct responses to the individual training words. In sessions 24 and 25, correct responses to both sets of words were equal.

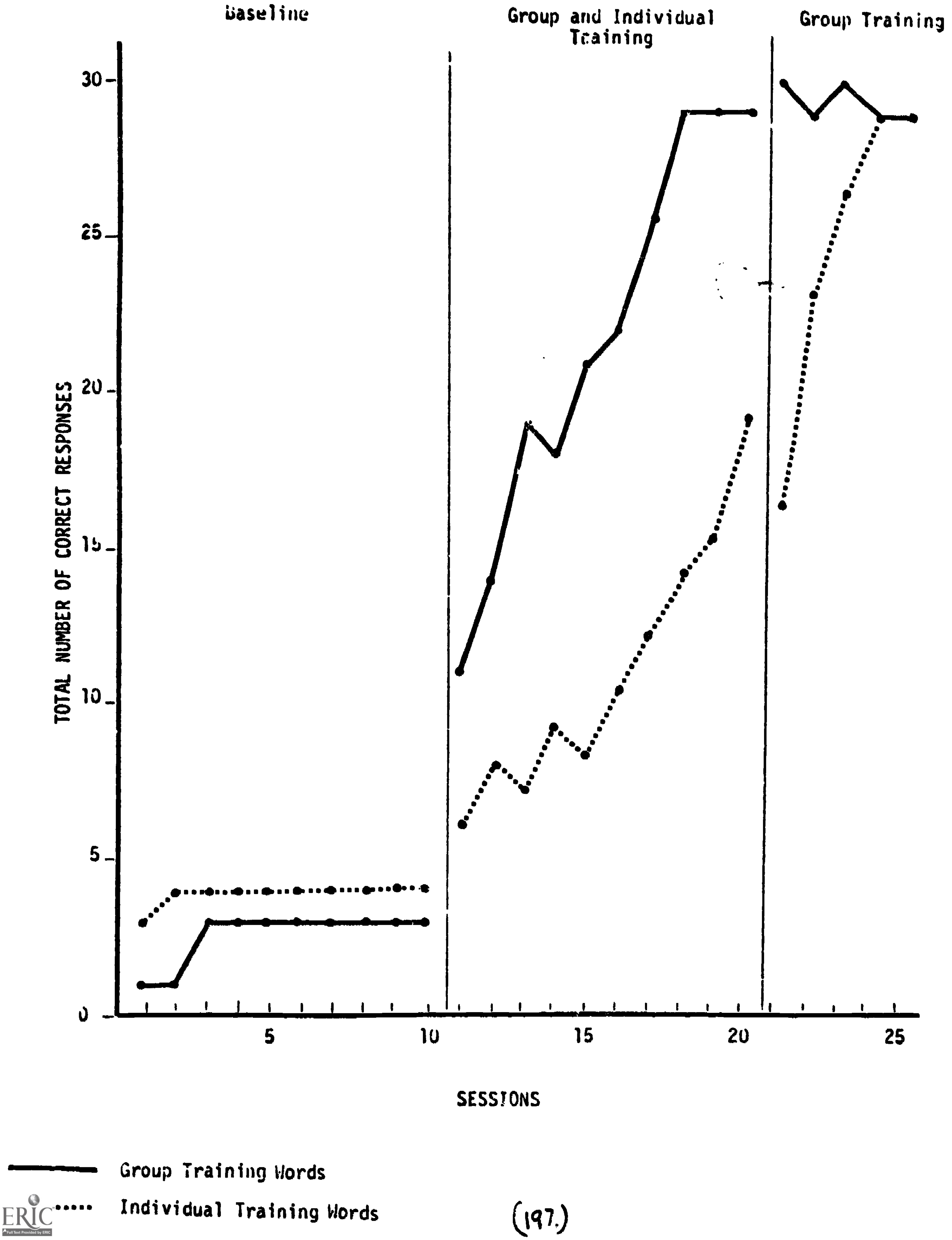
While a test for comprehension was incidental to the major purpose of the study, all students demonstrated to the satisfaction of the teacher that they understood what the words meant. For example, in response to the word "poison" most students said, "Don't eat it," or "Take it to mother;" in response to "left" and "right," they raised the appropriate hand; and in response to "men" and "women," they pointed to persons in the group or verbalized sex specific characteristics.

The results are in agreement with the previously cited work of Birnbrauer et al. (1965); Brown, et al. (1970); MacAulay, (1968); Staats & Butterfield, (1964). The application of basic learning principles was highly effective in providing trainable level students with a rudimentary sight vocabulary. More important for the purpose of this demonstration, the group training procedure was more efficient than the individual procedure. That is, given the same amount of time, direct presentations, and direct reinforcers, the students learned more rapidly in the group training situation. This finding is in agreement with the work of Bandura (1969) and Brown and Foshee (1968), which suggested that group training may be as effective as individual training in developing new behaviors, particularly if the students are capable of making the required responses and the reinforcers used are valued by all the members of the group.

While in the group training situation, the students had the opportunity to observe their peers being reinforced for performing behavior they would be asked to perform in the near future and, thus, to learn from each other. In addition, when peers were successful, the group spontaneously developed several social reinforcers such as clapping for one another and verbal expressions of congratulations. Had they not done so, the group procedure would have taken much less time than the relatively laborious procedure of taking individual students aside for tutoring. The group's enthusiasm may have enhanced the effectiveness of the group training condition.

Thus, with an equal investment in training time, group training may do more than solve problems in generalizing from the learning laboratory to the classroom. It may offer outcomes superior to those of individual training in an activity vastly more enjoyable to the students and to the teacher.

FIGURE 1 Number of Correct Responses Made to Individual Tra... ing Words and Group Training Words.



Baseline
Group and Individual Training
Group Training
TOTAL NUMBER OF CORRECT RESPONSES
0
5
10
15
20
25
30
5
10
15
20
25
SESSIONS
Group Training Words
Individual Training Words

(197.)

Trainable Level Retarded Students Teach Trainable Level Retarded Students[1]

Lou Brown, Nancy Fenrick, and Hope Klemme
University of Wisconsin and Madison Public Schools

There were two major justifications for the organization and implementation of this project. The first justification was concerned with instructional technology and the second was concerned with a philosophical commitment to the individual dignity of trainable level retarded students.

There were five major technological parts in the entire demonstration. These parts were cumulative in that in order for the second, third, fourth and fifth to be realized, proficiency in the first, second, third and fourth had to be demonstrated. The first part was designed to teach two trainable level students approximations of the reading process, i.e. to verbally label printed stimuli in a group and an individual instructional setting. The specific teaching procedures utilized to accomplish this objective were essentially those used by Brown et al. (1970) and Staats and Butterfield (1964). The students not only acquired information that was of functional value (word labels), but they also experienced a model implement a relatively simple and well

[1]This demonstration was supported in part by NICHD Grant 5 P01 HD 03352 to the University of Wisconsin Center on Mental Retardation and by the State of Wisconsin, Title VI-A, ESEA, Project #00030 in cooperation with the Madison Public Schools.

delineated teaching procedure.

The second part of this demonstration was designed so that, using the teaching procedures they had observed in the first part, the students could teach each other to label the different words they each had learned. The third part was designed to allow the students to form a two member team and teach their classmates the words they had learned, and the fourth part was concerned with involving more and more of the class into the teaching program. The fifth part was designed to capitalize on the skills acquired and the motivation developed to extend the reading program into a writing program for home-school communication.

In typical classroom programs for trainable level students there is never enough teacher time to program for the plethora of individual academic and behavioral deficits. If it can be demonstrated that trainable level students can assume minor, but nevertheless important, teaching responsibilities, valuable teacher time might be released for intensive consideration of more complex problems. Thus the technological justification of this project was to demonstrate that trainable level students can become effective teaching agents in a classroom.

Historically, educational efforts with trainable level retarded students have been focused first on some interested person "helping them" and second on teaching them to "help themselves." Rarely, do we concern ourselves with allowing this level student to assume functional roles in the assistance of others. The second justification for this project was to provide trainable level students with the opportunity to engage in what might be man's most dignifying experience, to be an active and responsible participant in the development of another human being.

Part I. Teaching Two Students Instructional Content and Technology

This initial part of the demonstration was primarily concerned with providing two students distinct sets of academic content which they could subsequently teach to each other. Thus, two groups of words were compiled: one group was taught to one student and a second group of words was taught to the second student. As the two students would later be requested to teach part of the information they had acquired to a group of their classmates, it was necessary to provide each of them with the experience of observing their teacher model a group instructional procedure. Therefore, a third group of words was compiled and taught to the two students in a group instructional setting.

Students

The two students involved in this part of the demonstration were enrolled in a special education class in a Midwestern public school. Barb was 14 years old and had obtained an IQ score of 44. Jan was 12 years old and had obtained an IQ score of 47. The teacher had suggested that these two girls be involved since they responded well to other learning situations and were quite competitive, yet cooperative, with each other.

Materials

Thirty words from a standard functional word list (Tudyman and Groelle, 1963) were selected and randomly assigned to three groups as follows: Group I: boy, car, food, room, girl, two, door, don't, on, school; Group II: wait, down, clock, store, father, three, woman, danger, street, fire; Group III: push, slow, up, not, pull, walk, one, lost, open, house. Each word was printed on a white 3" x 5" index card.

The teacher aide (TA) kept a record of each student's performance for each group of words on separate data sheets. These sheets were 8-1/2" x 11" sheets of white paper with the te words listed down the side and the session dates listed across the top. The TA wrote a plus mark down from the appropriate session and across from the appropriate word if a word was labeled correctly and a minus mark if a word was not labeled correctly. Two data sheets were used to record the students' performance in the individual instructional setting and two data sheets were used to record their performance in the group instructional setting.

A TA conducted the learning sessions at a table in the classroom with minimal interruption to the teacher and remaining seven students.

General Teaching Design

Group I words were taught individually to Barb and Group II words were taught individually to Jan. Group III words were taught simultaneously to Barb and Jan. In an alternating fashion, Barb or Jan was instructed individually. Then the two students were taught in a group setting. Finally, the other student was taught individually. For example, Barb would come to the table and the TA would teach the ten Group I words to her. Jan would then sit next to Barb and the TA would go through Group III words twice so that each of the two students had a chance to respond to each of the ten words. Finally, Barb would return to a classroom activity and the TA would teach Group II words to Jan.

Specific Teaching Procedures. The specific teaching procedure was held constant throughout all individual teaching sessions and consisted of the following steps:

A. The TA presented a word card to the student and asked, "What does this word say?"
B. If the students responded correctly, the TA recorded the response

and socially reinforced her with such verbal statements as "Great," "Good," "Beautiful," "You are learning to read," "I'm proud of you," as well as patting her on the back and head.

C. If the student did not correctly label the word, the TA recorded the error and proceeded as follows: 1) the TA modeled the correct response by reading the word aloud; 2) the TA asked the student to match the modeled response; 3) the TA modeled the word a second time; 4) the student was asked to repeat the word a second time; 5) the TA then asked again, "What does this word say?" 6) when the student responded correctly, she was socially reinforced by the TA.

D. When the student had correctly labeled a particular word, the next word in the group was presented and the same procedure was followed until the student had correctly labeled each of the ten words in a group.

The specific teaching procedure used in the group setting paralleled that used in the individual setting. The only procedural difference was that, while a particular word was presented to both students, only one of the students was asked to provide the correct label. That is, while each word was always presented to both students, Barb was asked to label the first word in Group III, Jan was asked to label the second word in Group III, etc. until each student had the opportunity to label each of the ten words in Group III. In addition, the group teaching setting seemed to provide for the development of a spontaneous reinforcer. The students observed the TA record their correct and incorrect responses. At the end of each session, the students compared their scores (total number of words correctly labeled) which resulted in such statements as, "I did better than you" and "You'll have to do better than that."

Measuring the Effects of the Teaching Procedure

Twenty-three 25 minute sessions (16 school days) were necessary to teach the two students to correctly label two groups of ten words. Figure 1 is a graphic illustration of the number of words each student labeled correctly in each session in the individual and group instructional settings.

Insert Figure 1 about here

Figure 1A illustrates the performance of Barb as she was acquiring the labels of the words in Group I. During the first three sessions, Barb was asked to provide the labels to the ten words in Group I and her responses were recorded (baseline). The instructional procedures were not administered during these three sessions. As can be discerned from Figure 1A, Barb was unable to provide the correct labels to any of the words in Group I. At session 4 the teaching procedures were initiated. As can be discerned from Figure 1A, Barb emitted her first correct label during session 8 and from that point to session 21 she continued to provide increasingly more correct labels. During sessions 21, 22, and 23, Barb correctly labeled the ten words in Group I.

Figure 1B graphically illustrates the performance of Jan as she was acquiring the labels to the ten words in Group II. During the baseline period (sessions 1, 2 and 3) Jan made no correct responses. At session 4 the teaching procedure was initiated. As can be discerned from Figure 1B, Jan emitted her first correct label during session 9 and continued to acquire more of the correct labels until during sessions 22 and 23, Jan correctly labeled the ten words in Group II.

Figure 1C graphically illustrates the performance of Barb and Jan as they acquired the labels to the ten words in Group III. During the baseline period (sessions 1, 2 and 3), neither Barb nor Jan emitted a correct response. At session 4 the group teaching procedure was initiated. As can be discerned from Figure 1C, Jan emitted her first correct label during session 5 and Barb emitted her first correct label during session 8. They continued to acquire more of the correct labels until during sessions 21, 22 and 23 both Barb and Jan correctly labeled the ten words in Group III.

Thus, at the end of session 23, Barb and Jan could verbally label two groups of ten words.

Part II. Two Trainable Level Students Teach Each Other

Barb now had in her repertoire academic content that was not in the repertoire of Jan and Jan had academic content in her repertoire that was not in the repertoire of Barb. In addition, both students had experienced the TA model the simple and well delineated teaching procedure in a group as well as in an individual instructional setting. This second part of the demonstration was concerned with Barb and Jan using this same teaching procedure to teach each other the verbal labels that each had acquired separately.

Materials

Group I and II words and the data sheets used in the first part were also used here. Beginning at session 6, a chart was constructed for each student. The charts were on 8-1/2" x 11" sheets of paper with the number of words correct on the vertical axis and the session numbers on the horizontal axis. It was explained to both students that their correct responses during each session would be totaled and placed on the chart and that, when their charts showed that they had taught each other ten words, they would be allowed to teach some of those words to the rest of the class.

Teaching Barb and Jan to Teach Each Other

The two students sat across from each other at a small rectangular table and the TA sat at one end. The TA taught the two students to teach

each other to label words in the following steps:

A. The TA presented the first word in Group I (the words that Barb knew) to Jan and asked, "What does this word say?" Jan, of course, did not know and the TA recorded an error on Jan's data sheet. The TA then proceeded to teach the word using exactly the same teaching procedure that had been used in the individual settings throughout the first part of this demonstration.
B. The TA presented the second word in Group I to Jan, asked Barb to repeat the statements of the TA, and asked Jan to respond to Barb. For example, the TA said, "What does this word say?" Barb then said to Jan, "What does this word say?" Jan, of course, did not know. The TA recorded an error in Jan's data sheet and went through, step by step, the teaching procedure, with Barb imitating her and Jan responding to Barb.
C. In the third step the TA presented the third word in Group I to Jan and asked Barb to teach that word to Jan.

At this point the instructional responsibilities were alternated and the TA went through the same three steps with Jan, using Group II words.

The TA then presented the fourth word in Group I and asked Barb to teach it to Jan. Immediately following, the TA presented the fourth word in Group II and asked Jan to teach it to Barb. This alternating pattern was continued through the ten words in Groups I and II through each session.

At the end of each session the plus marks (correct responses) were counted and recorded on the data sheets and on the charts. Improved performance was reinforced in two ways: 1) by praising the learner for knowing so many words, and 2) by praising the "student teacher" for being such a good teacher. In addition, if a student did poorly, it was mentioned that not only she, but also her "teacher" should try harder.

<u>Fading the Assistance of the TA</u>

During the first two presentations of session 1. the TA did everything except directly teach the students the words. That is, the TA presented the word card, modeled the teaching procedure, recorded the response, marked the charts, provided social reinforcement, and sat at the table with the students. By the end of session 1, the TA did everything but present the word card and model the teaching procedure. At session 5 the students assumed the additional responsibility of recording each other's responses. At session 8 the students recorded their total number of correct responses on their progress charts. At session 9 the students became responsible for dispensing all social reinforcement contingent upon correct responses and at session 13 the TA removed herself from the teaching area. Thus, the students gradually assumed more instructional responsibility until, during session 16, the TA was engaged in teaching another student in another part of the room and the two students conducted the learning session independently.

Measuring the Effects of Barb and Jan Teaching Each Other

Fifteen 15 minute sessions (9 school days) were necessary for the students to teach each other to correctly label ten words. Figure 2 is a graphic illustration of the number of words each student labeled correctly in each session.

Insert Figure 2 about here

As can be discerned from Figure 2A and B, neither Barb nor Jan was able to correctly label any of the ten words in Group II or Group I respectively during the initial teaching session. Both students learned to label increasingly more words at approximately the same rate until, at session 14, Barb could correctly label the ten words in Group II and Jan could correctly label the ten words in Group I. Both students maintained their perfect performance through session 15.

Part III. Two Trainable Level Students Teach Other Trainable Level Students

In Part I a simple and well delineated teaching procedure was utilized to teach Barb and Jan to verbally label 20 words. In Part II, utilizing the same teaching procedure, Barb and Jan taught each other ten additional words. This third part is concerned with Barb and Jan using the same teaching procedure to teach five of the words they had learned to their classmates.

Students-Teachers

There were a total of eleven persons in the classroom: the teacher, the TA, Barb and Jan, and seven other students. Barb and Jan assumed the role of "student teachers"; two of the seven students were involved in a more advanced reading program, and the five remaining functioned as students for this part of the demonstration. These five (four boys and one girl) ranged in age from 11 to 14 and in IQ scores from 33 to 44.

Barb and Jan sat behind a table across from the five students while the TA and teacher stood to the side.

Materials

From the thirty words Barb and Jan had learned, the teacher chose the five she felt to be most functional ("fire," "pull," "push," "school," "wait").

Data sheets, different from those used previously, were needed for the group teaching situation. The data sheets used here were 8-1/2" x 11" sheets of white paper with the five words printed down the side and the names of the five students across the top.

Beginning with session 4, individual progress was recorded on charts similar to those of Part II except that in this part individual charts were kept on the classroom chalkboard.

Cereal (peanut butter balls) was placed in a bowl and made available to each student immediately after a correct response.

Teaching Barb and Jan to Teach their Classmates

The five word cards were placed in a pile in front of the two "student teachers" and Barb was instructed to teach the first word to the first student; Jan, the second word to the second student, etc. Both the teacher and the TA verbally guided the two students through the four adaptations to a group situation that were required: 1) presenting the word card so that all five students could see it, 2) marking the data sheets by going to the square that was down from the student's name and across from the word, 3) deciding which student had not responded to which word by checking the data sheets, and 4) allowing a student to take a piece of cereal after correctly labeling a word.

In each session, the two "student teachers" alternated the teaching assignments until each of the five students had a chance to respond to each of the five words.

At the end of each session Barb and Jan counted the correct responses (plus marks) each student had made and recorded the total on the data sheets.

Just prior to the fourth session the teacher had drawn five charts on the chalkboard and had recorded on them each student's number of correct responses for each of the first three sessions. Starting with the end of the fourth session, Barb, Jan, the teacher, and the TA brought the five students to the charts on the chalkboard. While Barb and Jan reported each student's number of correct responses for that session, the teacher and TA recorded it on the individual's chart and explained to the student how his performance compared with that of previous sessions and with that of his classmates. If a student's performance indicated progress, he was congratulated by the teacher, the TA, and his classmates through verbal statements of approval and handclapping. When the progress of each student was recorded on the charts, Barb and Jan were thanked by the teacher and TA for teaching the class. These procedures were maintained throughout the remaining sessions.

Fading Teacher and TA Assistance

During session 1 Barb and Jan required teacher and TA guidance in adapting the teaching procedure to a group situation. Throughout the ensuing sessions, as Barb and Jan became more adept with the teaching requirements and as the students became spontaneous sources of verbal reinforcement for correct responses, the teacher and TA were able to fade their intrasession prompting and social reinforcement. By session 7 the teacher and TA were able to stand to the side of the room and merely observe the students conduct the learning situation without their assistance. The teacher and TA continued, however, to provide guidance in marking the charts on the chalkboard.

Measuring the Effects of Barb and Jan Teaching Their Classmates

In any given session, each of the five students could obtain a score of from 0 to 5. In ten 15 minute sessions Barb and Jan had brought the group of five students to a criterion of 23 correct responses of a possible 25. Figure 3 is a graphic illustration of the number of words each student labeled correctly in each session.

Insert Figure 3 about here

Since the performance of each student is unique, individual records are presented. As can be discerned from Figure 3 A-E, none of the five students were able to correctly label any of the five words during the initial teaching session. By session 3, two of the students (S1, S2) were able to correctly label all five words and maintained perfect responding throughout the remaining sessions. The other three students (S3, S4, S5) exhibited more variable performance but gradually learned to label increasingly more words until, during the final two sessions, they labeled either four or all five of the words correctly.

Part IV. Trainable Level Students Conduct Review Sessions

By the constant utilization of a simple and well delineated teaching procedure, two students learned 20 words from a TA (Part I), taught each other ten additional words (Part II), and then taught five of their classmates five words (Part III). The fourth part was concerned with two teams of two students each conducting review sessions of previously learned words with the rest of the class.

Students

Two review teams were established. Team 1 consisted of Barb and Joe, a 14 year old who had obtained an IQ score of 44. Team 2, which started one week later, consisted of Jan and Sue, a 13 year old who had obtained an IQ score of 33. Joe and Sue were the first students (S1, S2) to learn the labels of the five words in Part III.

Materials

Words reviewed were these which the teacher had taught throughout the year, e.g. "go," "poison," "stop," "danger," "right,". They were printed on 5" by 7" blue index cards.

Data sheets (those of Part III) were used but charts were not kept. This fourth part of the demonstration was started during the final sessions of Part III and usually involved a team reviewing four or five words with four or five students.

Teaching the Students to Conduct the Review Sessions

Teaching the two new students to conduct the review sessions required only a single 15 minute session since both had considerable experience as participants in similar instructional settings. The initial step was to ascertain that the two students could read the names of the students from the data sheets and the words both from the word cards and from the data sheets. The second step involved teaching the students to mark the data sheets by first, going to the square directly down from the name and directly across from the word and second, by placing a plus mark if the word was labeled correctly and a minus mark if the word was not labeled correctly. A final step involved explaining and modeling the procedure of having the word cards in a pile, presenting the top card to the first student, placing it face down, presenting the next card to the next student, etc. until each student had a chance to respond to each of the review words. The reviewers learned these steps by first observing the TA model them and second by matching the TA's response until they could perform each step successfully.

Using exactly the same teaching procedure that had been used since the beginning of the demonstration, the two members of a review team alternately presented the words until each student had a chance to respond to each of the review words. At the end of each session the review team, under the watchful eyes of the other students, counted the number of correct responses (plus marks) and wrote each student's total on the data sheets.

The entire group usually responded spontaneously with appropriate reinforcement, i.e. handclapping if a student correctly labeled all of the words and statements such as "you have to do better than that" if a student missed any of the words. At the end of each session, the review team members were thanked for teaching the class.

Fading Teacher and TA Assistance

Once again, the classroom teacher and TA offered frequent verbal guidance and reinforcement during the initial sessions of the review procedure. They were able to quickly decrease their participation in this as the experienced team member (i.e. Barb or Jan) assumed more of the responsibility. After a few sessions, the novice team member (i.e. Joe or Sue) became more adept at carrying out all of the components of the review task and by the end of the fifth session it was possible for the teacher and TA to engage in other activities while the students conducted review sessions by themselves.

Measuring the Effect of Student Teams Conducting Review Sessions

Since there were two review teams, several different sets of words, and the sessions were for reviewing purposes, no consistent data were kept. However, what is significant is that on the first day of this program a very tentative review team hesitantly started to conduct a review session but four days later a very confident team competently conducted a review session completely independent of the teacher or TA. Two review teams (four students) had been able to assume "teaching" responsibilities and several others could have feasibly performed as well except that the end of the school year terminated the program.

By the end of Part IV, the constant utilization of a simple and well delineated teaching procedure had enabled: 1) two students to learn 20 words, 2) the two students to teach each other ten more words, 3) the two students to teach five other students five words, 4) four students to conduct review sessions with their classmates.

Part V. Extension of the Learned Material into a Handwriting Program for Home-School Communication

After learning their sets of words, Barb, Jan, and Joe expressed a desire to show their families what they had learned. As the end of the school year was approaching, the teacher also wished to provide a vehicle for the carry over of academic material through the summer months. As these three students had been involved in a handwriting program and their printing efforts were quite legible, the teacher and TA conducted a combination of handwriting projects centered around the newly acquired sight vocabulary.

The first project involved Barb and Jan upon completion of their learning the 30 words. In three ten minute sessions, Barb and Jan printed the 30 words on 3" x 5" cards using the TA's cards as models. The criteria for acceptable printing were: 1) that the student herself could read the words; 2) that the other student could read the words; and 3) that the TA saw no difficulty in anyone else reading the words. It is of importance to note that, although the two students advised each other to rewrite some of the words (Jan told Barb to recopy one and Barb told Jan to recopy three) the TA saw no need for further changes.

A second, similar project involved only Joe after he had learned the five words in Part III from Barb and Jan. Joe's task became that of printing the five words on 3" x 5" cards using the TA's cards as models.

His criteria for acceptable printing were: 1) that he himself could read the words and 2) that the TA saw no difficulty in anyone reading the words. Joe easily met both of these criteria in a single 10 minute handwriting session.

The third handwriting project took place during the final week of classes and involved Barb, Jan and Joe printing the words they had learned to label both in this demonstration and throughout the year on a sheet of paper to give to their family. The students' lists of words were accompanied by a letter and a phone call to the parents requesting that they continue to review these words with the students regularly throughout the summer months. Once again, the three students had no difficulty meeting the criteria of acceptable printing: 1) that the students themselves could read the words and 2) that the teacher saw no problem in anyone else reading the words.

While the writing program was relatively brief and thus may seem educationally insignificant, the fact that the students were writing by themselves academic material they had spent much time acquiring to bring home to their families and the fact that they themselves were the judges of the acceptability of their writing efforts, gave the project considerable subjective value.

DISCUSSION

Technologically, the project was a success. Not only did the students learn the word labels and the teaching technique, they also used their skills to effectively teach their peers. If these outcomes receive additional empirical support, a teacher may be able to arrange her classroom so that some of her students can assume minor yet relevant teaching responsibilities and thus free her for more sophisticated and intensive instructional programs.

Philosophically, the project was exciting and inspiring. From passive recipients of the directives of others, the students evolved to active and concerned participants in their own education. It is indeed exhilarating to see trainable level retarded students demand that a reading lesson be extended, run down the halls (during recess) telling other teachers and even visitors how many words they had learned, cheer when their peers emitted a correct response and brag about their ability to teach each other.

REFERENCES

Brown, L., Klemme, H., Hermanson, J., Haubrich, P., & Ora, J. Teaching sight vocabulary to trainable level students utilizing the systematic application of behavior modification principles. _Teaching exceptional children_, Spring, 1970.

Staats, A. W. & Butterfield, W. H. Treatment of nonreading in a culturally deprived juvenile delinquent: an application of reinforcement principles. _Child development_, 1965, _36_, 925-942.

Tudyman, A. & Groelle, M. C. _A functional basic word list for special pupils_. Pittsburgh: Stanwix House Inc., 1963.

List of Figures

Figure 1

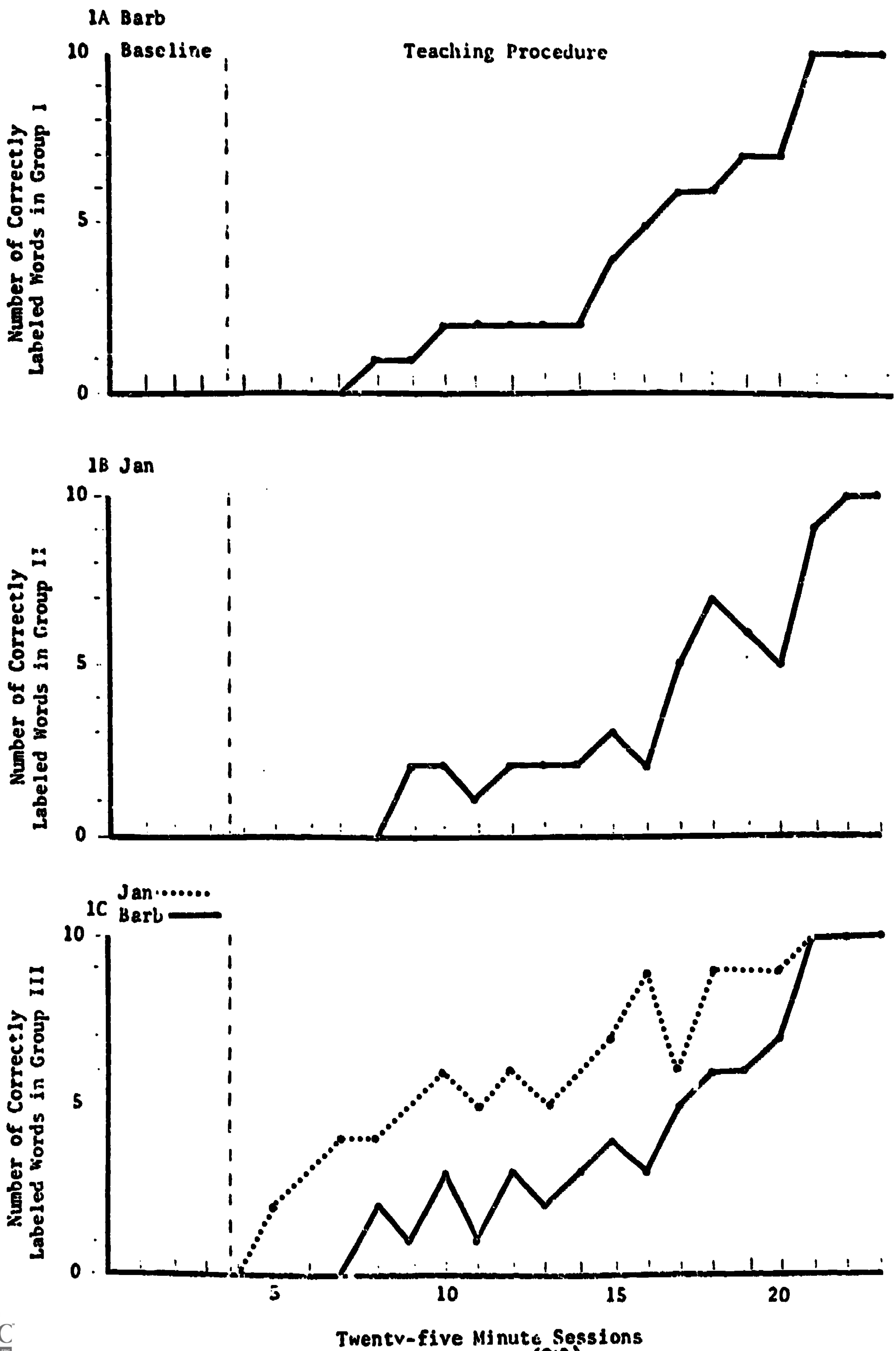
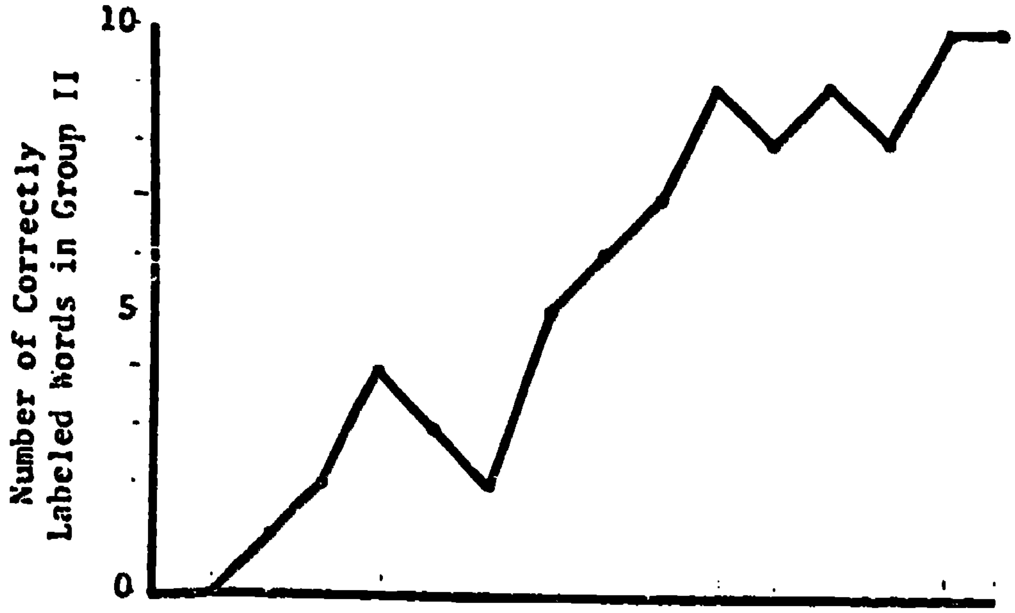

1A Barb
Basclire
Teaching Procedure
Number of Correctly Labeled Words in Group I
10
5
0
1B Jan
Number of Correctly Labeled Words in Group II
10
5
0
Jan
1C Barb
Number of Correctly Labeled Words in Group III
10
5
0
5
10
15
20
Twentv-five Minute Sessions

Figure 2

2A Barb



2B Jan

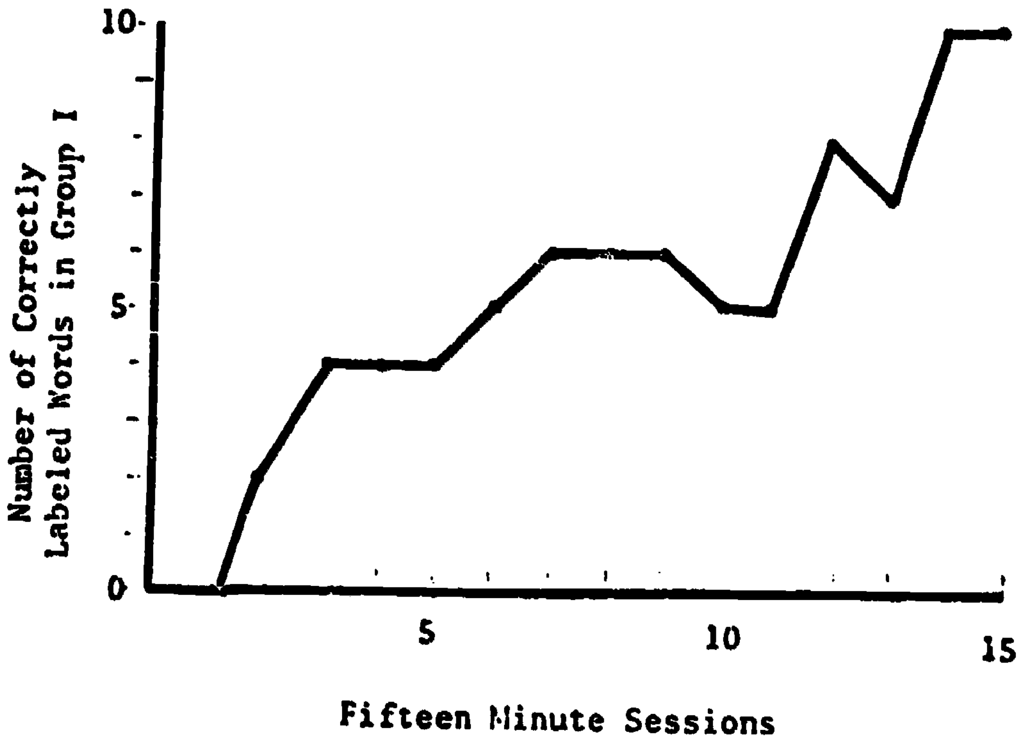
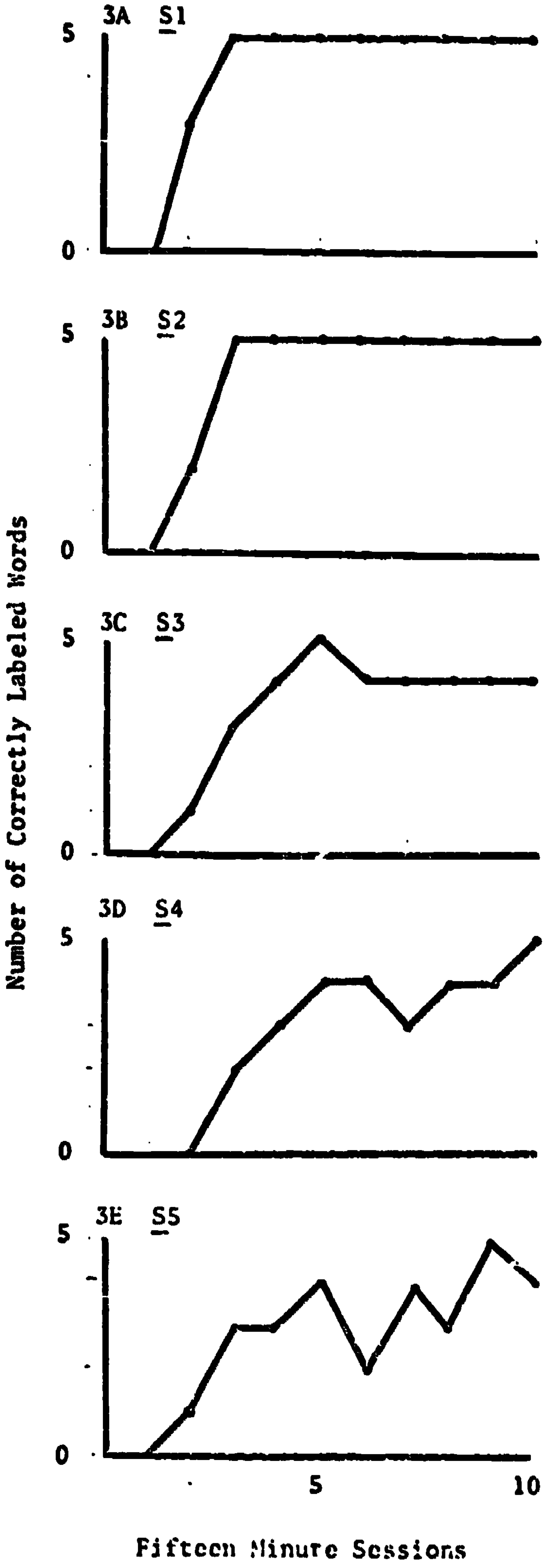


Figure 3


3A S1
3B S2
3C S3
3D S4
3E S5
5
0
5
10
Number of Correctly Labeled Words
Fifteen Minute Sessions

Lou Brown, Ph.D. Assistant Professor, Department of Studies in Behavioral Disabilities, University of Wisconsin, Madison, Wisconsin. Educational Consultant, Madison Public Schools, Madison, Wisconsin.

Nancy Fenrick, Research Assistant, University of Wisconsin, Madison, Wisconsin.

Hope Klemme, Teacher, Madison Public Schools, Madison, Wisconsin.

Teaching Functional Reading to

Trainable Level Retarded Students[1]

Lou Brown and Lucille Perlmutter

University of Wisconsin and Madison Public Schools

One day the teacher asked Mary to put the paper on top of the cabinet. What did Mary do? She put the pencil on the bottom of the bookcase. The next day the teacher asked John to put the scissors in the drawer. What did John do? He put tape in back of the Peabody Language Development Kit. The next day the class was going to bake a cake and each student had his own box of cake mix. The teacher said, "Look at the back of the box and read the words." What did the students do? Most looked at the front (that's where the picture is). One student looked at the words on the box and said, "Jesus loves me." Another student bit the top off and smiled. And on it went. Two things were obvious. The students could neither read nor follow verbal directions.

After reviewing much literature concerning reading, Gray, Baker and Stancyk (1969) concluded:

> Anyone familiar with reading is aware of the enormous volume of literature on the subject. The wide uneveness in quality of information and the appearance of conflicting results contribute to a very hazy, disorganized and

[1]This demonstration was supported in part by NICHD Grant 5 PO1 HD 03352 to the University of Wisconsin Center on Mental Retardation and by the State of Wisconsin, Title VI-A, ESEA, Project 400030 in cooperation with the Madison Public Schools.

> confusing situation. . . From the mass of evidence presented in the literature it is quite possible to substantiate a variety of positions based upon selectively choosing the appropriate references. Thus, from a larger perspective it would appear that the general findings from much of the research data are inconclusive.

While this confusion and divergence is tolerated (and perhaps even necessary) in academic and research sanctuaries, the typical classroom teacher of trainable level retarded students can afford no such luxury.

Although it appears that many students learn to read regardless of the instructional procedures employed or the theoretical assumptions underlying such procedures (Bond and Dykstra, 1967), it is extremely doubtful that trainable level students fall into this category. Indeed, teaching trainable level students to read has proven to be such a formidable task that many curricula suggest confining reading instruction to the acquisition of caution or safety word sight vocabularies. Recently, however, the successful utilization of empirically established learning principles with students who exhibited many different kinds of reading problems has provided special education with a note of much needed optimism (Birnbrauer, Wolf, Kidder and Tague, 1965; Staats and Butterfield, 1965; Wolf, Giles and Hall, 1968).

Inherent to the aforementioned studies was the conversion of the often nebulous concept "reading" into a series of observable responses to printed stimuli. Once reading was defined in such a way that the components could be measured, reinforcement principles were systematically applied to increase the number of reading responses in the students' repertoires. This kind of approach to teaching reading is particularly relevant for classroom teachers of trainable level students because it allows the teacher to conceptualize her instructional problem in such a way that she can do something about it and immediately assess the effectiveness of her procedures. Immediate assessment is crucial for trainable students in that progressions through graduated instructional materials must be controlled by the responses of the students at each gradation. It cannot be assumed that these students will acquire the information or skills inherent in the materials incidentally.

In this demonstration functional reading was instructionally defined as discrete and observable motor responses to printed stimuli. That is, students were presented with a series of printed stimuli (sentences). Verbally labeling each of the stimuli was deemed a necessary, but not a sufficient criterion for functional reading. In order to meet the criteria for functional reading, the students had to 1) label the printed stimuli and 2) do what the sentences indicated they should do.

The entire program was divided into three parts. The first part was the baseline period in which it was determined how well the students could label words in sentences (Ia), how well they could label and then respond differentially to the words in the sentences (Ib), and how well they could respond differentially after listening to the teacher label the words in the sentences (Ic).

In the second part the students received instruction designed to teach them to verbally label the stimulus words (IIa) and to verbally label the words in the order in which these words appeared in a sentence (IIb). Subsequently, each student's ability to perform the tasks involved in Parts IIa and IIb was evaluated (IIc).

In the third part the students received instruction designed to teach them to respond differentially to nine location cues (IIIa). The students were then evaluated on their ability to verbally label the stimulus words and respond differentially to those words (IIIb) and on their ability to listen to the teacher label the same words and respond differentially to the words the teacher labeled (III c).

METHOD

Students

The seven students (Ss) ranged in age from 14 to 19 ($\bar{X}$=16), in IQ scores from 39 to 51 ($\bar{X}$=44), and in years in school from 2 to 12 ($\bar{X}$=9.2). Ss also received such medical diagnoses as curvature of the spine, congenital brain damage, mental retardation due to meningo-encephalitis, Huntington's chorea, and Downs syndrome. The four remaining Ss in the class were excluded from the demonstration: two Ss correctly labeled 80% of the words on the baseline tests and were placed on more advanced reading programs; another S was removed from school for medical reasons; and the fourth S was placed in a less complex program due to extremely low response rates on even the most simple tasks.

Materials

Seventeen different words were randomly assigned to two sets of 6 and one set of 5 and printed on 3" x 5" flash cards. The words in Set I were: "is," "over," "back," "in," "front," "top;" the words in Set II were: "penny," "on," "the," "bottom," "side," "right;" the words in Set III were: "left," "of," "under," "inside," "box."

The 17 words were also arranged into the following 9 different sentences and printed on 2" x 8" sentence cards: The penny is (on top of, on the bottom of, under, over, on the right side of, on the left side of, in front of, in back of, inside) the box.

Three different data sheets were used. The first data sheet consisted of the 9 sentences with 6 lines between each. If S responded appropriately to a word, either by labeling it correctly or labeling it in the correct order, a "+" sign was recorded under that word. If S made a correct location response after reading the sentence or after listening to the teacher read the sentences a "+" sign was recorded in a box in the right hand margin alongside the sentence.

A second data sheet was used to record responses to the three sets of flash cards. The words were printed down the side, and the names of Ss were printed across the top. When a S correctly responded to a flash card a "+" mark was made in the space across from the word and down from his name.

The third data sheet was similar to that used with the flash cards except that the 9 location cues were printed down the side.

Frequency polygons were posted on the classroom wall and used to illustrate each S's progress on the 3 sets of words.

The box used to teach and measure location responses was designed by the teacher (T) and built by the school custodian[1] (see picture below). It consisted of a 6-1/2" x 11-1/2" x 2" box suspended in a 15-1/2" x 24" x 2" frame. Two 14" metal rods were inserted through the box to insure suspension. Nine 3" x 2" hinges were attached to 7 different locations (exceptions were over and on top of) and pennies were placed at each of the 9 locations.

Part I

Three different baselines were obtained in Part I. The first baseline determined how many words each S could verbally label in the order in which they occurred in the sentences (Ia). One S was taken to the side

---

[1]The assistance of Ron Peschal, Sunnyside School custodian is acknowledged and appreciated.

of the classroom by T, presented with each of the 9 sentence cards, and instructed to label the words on the cards. All correct labels were recorded on S's data sheet.

The second baseline determined how many correct differential location responses S made after labeling the 9 sentences. Immediately after the first baseline was obtained S was again instructed to label the words on the sentence cards and to point to the specific penny on the box referred to in the sentence (Ib).

The third baseline determined how many correct location responses S could make after listening to T label the words on the sentence cards. Immediately after the second baseline was obtained S was instructed to listen to T as she labeled the sentences. After T labeled the words on a sentence card, S was instructed to point to the penny referred to in the sentence (Ic).

The seven Ss were tested on their ability to perform the 3 tasks on 3 consecutive school days.

Part II

The first part of the program determined how well each S could label the words in sentence order, respond differentially to the sentence after labeling the words, and respond differentially to the sentences after listening to T label the words. In the second part of the program Ss were taught to label the words (IIa), label the words in sentence order (IIb) ?
and were evaluated on how well they could label the words in sentence order (IIc).

IIa. Teaching the students to label the words. The seven Ss were randomly assigned to two groups (Groups I and II) of four (S_1, S_2, S_3, S_4) and three (S_5, S_6, S_7). While one group received instruction, the remaining group participated in prevocational tasks. Instruction was provided at a table with T and Ss on opposite sides.

The specific teaching procedure was essentially that used by Brown et al. (1970) in which T presented a flash card, modeled the correct label, instructed S to match the label provided, and reinforced S when he did so. The specific steps are as follows:

Step I. T presented the first card of Set 1 to Group I and said, "This word says _____. What does this word say?" If each S in Group I matched the label provided, T made such reinforcing statements as "Good," "Fine," "You are learning how to read," "I'm proud of you." If any S did not match the correct label the procedure was repeated. This procedure was repeated until Ss correctly matched each of the 6 labels provided by T.

Step II. T presented the first word card in Set I to S_1 and said, "What does this word say?" and recorded Ss response. If S_1 provided the correct label he was socially reinforced. If S_1 did not provide the correct label, T modeled the correct label, asked S_1 to match the label she provided and reinforced S_1 when he matched her label. The second word in Set I was then presented to S_2, the third word in Set I was presented to S_3 etc. When each S in Group I responded to each card in Set I the session was terminated. Group I was referred to the prevocational tasks and Group II was brought to the table. Exactly the same procedure was used with Group II.

Step III. When either Group I or Group II reached criterion on the words in Set I (24 and 18 consecutive correct responses respectively in three consecutive sessions) the words in Set II were presented. The same procedures used to teach Set I words were used to teach the words in Set II. However, prior to each session in which Set II words were taught, the words in Set I were reviewed. The review consisted of presenting the words in Set I to a group and asking for a group response. Incorrect responses were not corrected.

Step IV. When either Group I or Group II reached criterion on Set II, the words in Set III were presented. The same procedures used to teach Sets I and II words were used to teach the words in Set III. In addition, Set I and II words were reviewed prior to each session in which Set III words were taught.

IIb. Teaching students to label the words in sentence order. During the baseline tests T noticed that when asked to label the words on the sentence cards, Ss seemed to randomly select words to respond to. Apparently they had not learned that words in sentences are labeled from left to right. Although Ss had learned to label the words on flash cards, it was necessary to teach them to label the words in the order in which they occurred in the sentences.

The specific procedure used to teach labeling from left to right is as follows:

Step I. T presented a sentence card to a group and pointed to each word with a pencil as she labeled them from left to right.
Step II. Ss were then instructed to match the order T modeled.
Step III. If a group responded appropriately, it was reinforced. If a group did not respond appropriately, the procedure was repeated.

This procedure was followed until each group had an opportunity to respond to each of the 9 sentence cards.

IIc. Measuring the students' ability to label words in sentence order. Each S in each group was tested individually on his ability to label the words in the 9 sentences from left to right. T presented the first sentence card to S_1 and asked him to label the words from left to right. As S_1 labeled the words on the sentence card, T recorded all correct responses on his data sheet. This procedure was followed until each S responded to each of the 9 sentences on 3 consecutive school days.

Results of teaching students to verbally label printed words. In each session the 4 Ss in Group I and the 3 Ss in Group II were given a chance to label the 6 words in Set I, the 6 words in Set II or the 5 words in Set III. Groups I and II could emit 0 to 24 and 0 to 18 correct responses to the words in Sets I and II respectively. Since there were only 5 words in Set III, Group I could emit 0 to 20 correct responses and Group II could emit 0 to 15 correct responses on any given session.

During the Set I baseline period (trials 1, 2, 3) Group I emitted 4, 0, and 0 correct responses respectively. During the Set II baseline period Group I emitted only one correct response. No correct responses were made in the Set III baseline period (Figure 1a).

Insert Figure 1 about here

After baseline data were obtained from the three sets of words, Group I was taught to label the words in Sets I, II and III respectively. That is, when Group I emitted 24 correct responses in three consecutive sessions to the words in Set I, the words in Set II were presented. When Group I emitted 24 correct responses in three consecutive sessions to the words in Set II, the words in Set III were presented until Group I reached criterion on the words in Set III. As can be discerned from Figure 1a, 16, 16, and 17 sessions were necessary for Group I to reach criterion on Sets I, II, and III respectively.

During the Set I baseline period Group II emitted one correct response in each of the three sessions. Group II did not emit a correct response to any of the words in Sets II and III (Figure 1b).

After baseline data were obtained, Group II was taught to label the words in Sets I, II and III respectively. As can be discerned from Figure 1b; 20, 20, and 18 sessions were necessary for Group II to reach criterion on Sets I, II and III respectively.

<u>Results of teaching students to label words in sentence order</u>. During the baseline period (trials 1, 2, 3) the 4 <u>Ss</u> in Group I and the 3 <u>Ss</u> in Group II were asked to read the 9 sentences aloud (total 71 words). On any given trial Groups I and II could made a total of 284 and 213 correct labeling responses

respectively. As can be discerned from Figure 2, Group I correctly labeled 15, 9 and 9 words in sentence order ($\bar{X}$=3.8% per trial) and Group II correctly labeled 0, 8 and 8 words in sentence order ($\bar{X}$=2.5% per trial) during the first three trials.

Insert Figure 2 about here

Following the baseline period the two groups were taught to verbally label the 71 words (Step IIa) and to label those words in sentence order (Step IIb). Subsequently the two groups were given 3 opportunities to label the words in sentence order (trials 4, 5, 6). Group I correctly labeled 270, 272, and 275 words in sentence order ($\bar{X}$=96% per trial) and Group II correctly labeled 211, 212, and 213 words correctly in sentence order ($\bar{X}$=99% per trial).

Part III

In Part II Ss were taught to correctly label the words in the order in which they occurred in the sentences. According to the instructional definition, Ss had met one of the two necessary criteria for functional reading. The remaining criterion was that Ss respond differentially to each of th.) sentences.

IIIa. Teaching differential location responses. The location box was placed on a table in the classroom. Ss were seated in front of the box and T stood behind the box.

The procedure used to teach differential location responses is as follows:

Step I. T read the first sentence, "The penny is on top of the box" and pointed with her finger to the appropriate penny. T then read the second sentence and pointed to the second location. This procedure was followed until T read and responded differentially to each of the 9 sentences.

Step II. T labeled the words on the first sentence card and asked S_1 in Group I to point to the penny referred to in the sentence. If S_1 responded appropriately, he was reinforced. If S_1 did not respond appropriately, T again labeled the words in the first sentence, modeled the correct location response, again labeled the words in the sentence and asked S_1 to respond to the penny referred to in the sentence.

This procedure was followed until each S in each group correctly responded to each of the 9 sentences in three consecutive sessions.

IIIb. Measuring the students' ability to label the words and respond differentially. Each S in each group was tested individually on his ability to respond differentially to the printed words in the 9 sentences. T presented the first sentence card, asked S to label the words in the sentence, and point to the penny to which the sentence referred. T recorded S's response on his data sheet. This procedure was followed until each S in each group made a location response to each of the 9 sentences on 3 consecutive school days.

IIIc. Measuring students' ability to listen to sentences and respond differentially. Each S in each group was tested individually on his ability to make an appropriate location response after listening to T label the words in the 9 sentences. T labeled the words in the first sentence card and then instructed S to point to the penny referred to in the sentence. T recorded the response on S's data sheet. This procedure was followed until each S in each group had the opportunity to respond to each of the 9 sentences on 3 consecutive school days.

Results of teaching students to respond differentially to printed stimuli. During the baseline period (trials 1, 2, 3) Groups I and II were asked to label the words in the 9 sentences aloud and make a response based upon the words labeled. On any given trial Groups I and II could make a total of 36 and 27 correct location responses respectively. As can be discerned from Figure 3, Groups I and II did not make a correct response in any of the first 3 trials. This was expected since, at this point, they could not label the words and they were not allowed to make a chance response.

Insert Figure 3 about here

Following the baseline period the two groups were taught to: 1) label the 71 words in the 9 sentences (Step IIa); 2) label these words in the order in which they occurred in the sentences (Step IIb); and 3) make differential location responses to verbal cues (Step IIIa). Subsequently, the two groups were again tested on their ability to label and respond differentially to the 9 sentences. During trials 4, 5 and 6, Group I made 36, 35 and 36 correct location responses respectively ($\bar{X}$=99% per trial). Group II made 27 correct location responses on the 3 trials.

Results of teaching students to respond differentially to verbal stimuli. During the baseline period (trials 1, 2, 3) each S in Groups I and II was asked to listen to T label the words in the 9 sentences and then to respond differentially to each sentence. On any given trial Groups I and II could make a total of 36 and 27 correct location responses respectively. As can be discerned from Figure 4, Group I made a total of 12, 14 and 20 correct location responses ($\bar{X}$=43% per trial) and Group II made 15, 13 and 17 correct location responses ($\bar{X}$=55% per trial). When performance on the first 3 trials in Figure 4 is compared with performance on the first 3 trials of Figure 3 it seems quite obvious that listening vocabularies were considerably more advanced than sight vocabularies. Nevertheless, a 43% and a 55% listening vocabulary efficiency level is certainly less than desirable.

Insert Figure 4 about here

Following the baseline period the two groups were taught to: 1) verbal label the 71 words in the 9 sentences (Step IIa); 2) label these words in the order in which they occurred in the sentence (Step IIb); and 3) make differential location responses to verbal stimuli (Step IIIa).

Subsequently, the two groups were again tested on their ability to listen and respond differentially to sentences the teacher labeled. During trails 4, 5 and 6 both groups responded perfectly.

DISCUSSION

Functional reading was instructionally defined as discrete and observable motor responses to printed stimuli. Obviously, neither printed stimuli nor observable motor responses are necessary for reading. For example, a person can be presented with manual symbols representing the words of a poem, never respond differentially to the symbols, and yet it is possible that he did, in fact, read the words, i.e. abstract the "meaning" of the writer. The teacher of trainable level students cannot assume that her students can read just because they look at a book or can verbally label printed words. One way to assure that the students understand the stimuli presented is to require differential responding to those stimuli. From the data presented, it appears that the students in this demonstration met the criteria for functional reading, i.e. they responded differentially to a series of printed stimuli.

If the results obtained here can be replicated with similar students using different words and responses, a note of optimism may be injected into school programs for trainable students. It is becoming increasingly evident that reinforcement principles are a valid and relevant source of instructional technology and that the systematic utilization of these principles with groups of children in public school classrooms can result in trainable level students acquiring academic skills that heretofore had been excluded from curricula. That is, restrictive curricula may be due to a deficient instructional technology rather than to the learning capabilities of the students (Birnbrauer et al., 1965; Brown et al., 1970).

The entire demonstration required approximately 60 instructional hours (one hour per day for 60 school days). Granted, the utilization of 60 instructional hours to teach seven students to read nine sentences may not seem highly efficient in terms of cost-effectiveness. However, several factors should also be considered. First, a major hurdle in the initial stages was to get the students to even attempt the task. Once success was obtained and reinforced by the teacher and classmates, the students became excited about participating. The two most striking examples of this involvement occurred when one student said, "They told me at the clinic I would never read, but I can," and when the students would bring visitors to the room and show on their charts how many words they had learned.

Second, it seems reasonable that if the learning principles were applied earlier in their school careers, learning sets might have been developed (Brown et al., 1970). That is, it has been repeatedly demonstrated that the more organisms solve a particular kind of problem the more efficient they become at solving similar problems (Kaufman and Prehm, 1966). If trainable level students can be taught differential responses to instructional material at an early age, it is feasible that they may become increasingly efficient at acquiring additional responses to more and more instructional materials.

Third, a response controlled progression procedure was used. In many classrooms time controlled progression through instructional material. A teacher will present material X for a specified time period and then progress to material Y etc. until, by the end of the school year, a considerable amount of material is presented. One problem with a time controlled progression is that often the teacher is presenting "May" material and the students are still trying to master "September" material. In a response controlled progression procedure step B is not introduced until the students have demonstrated criterion performance on step A (Gray et al., 1969). While the amount of material covered is considerably less than that covered in time controlled progression, the amount of material learned is probably considerably more.

A response controlled progression through instructional material is particularly important for trainable level students because the rate of acquisition is, in general, low and may be nonexistent for certain materials. Thus, the teacher must do more than constantly present material and assume that the students will acquire the information by incidental or observational learning or by trial and error. In most progressions through instructional material the information is cumulative either in quantity or complexity. In a time controlled progression it is quite difficult to determine if the student has in his repertoire all the responses in the first step that are necessary for success in the second. In response controlled progression, the second step is not initiated until the students are responding at or close to 100% efficiency on the first step.

Finally, it should be noted that the data obtained in the demonstration are essentially correlational. While research designs using subjects as their own controls are available (Baer, Wolf and Risley, 1968; Brown et al., 1970; Hall et al., 1970) and relevant to classroom problems, the intent of the program was not research but demonstration. Obviously, the specific variables that accounted for the changes in behavior can only be delineated with more stringent parametric manipulations.

List of Figures

Figure 1a

Group I

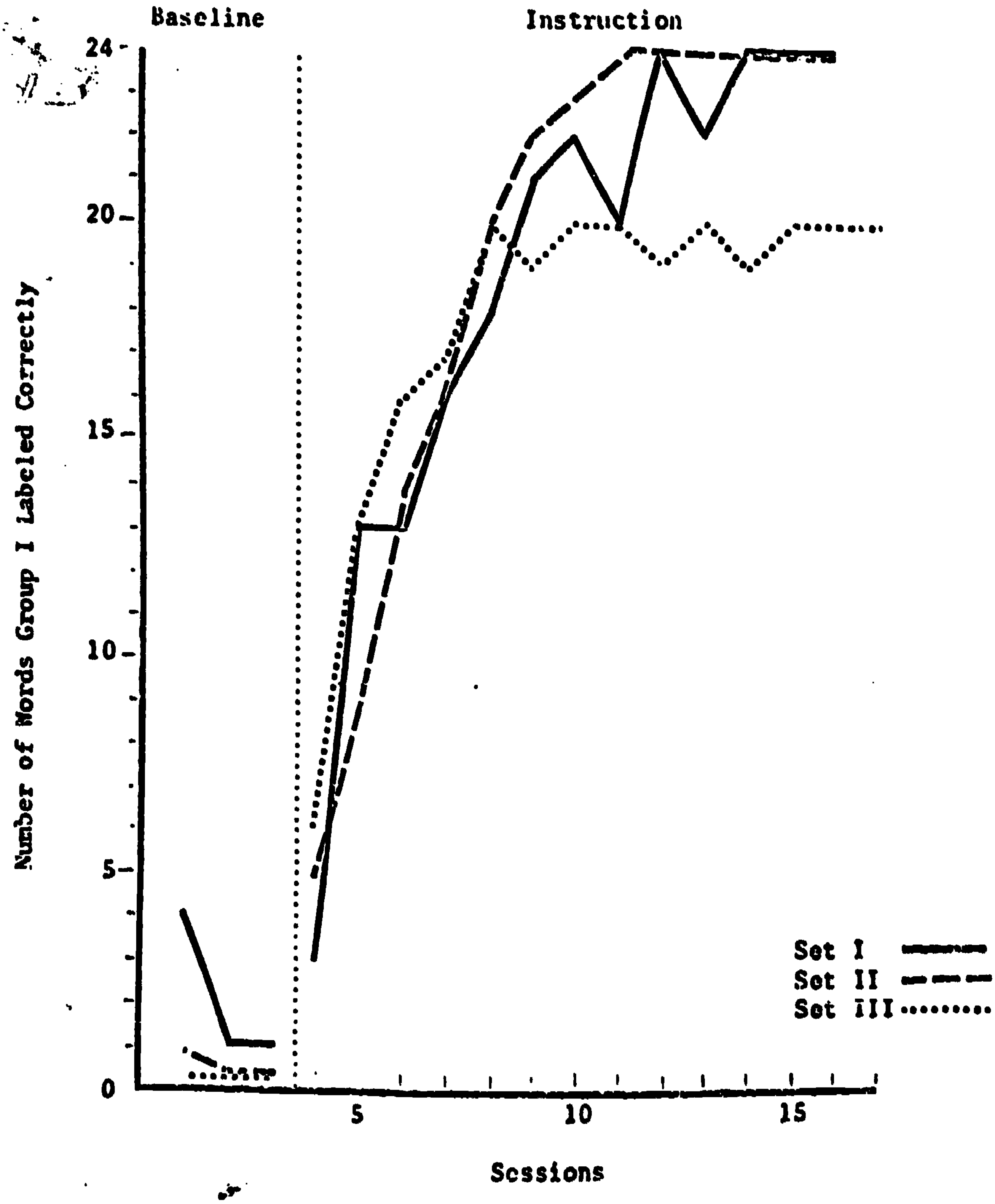
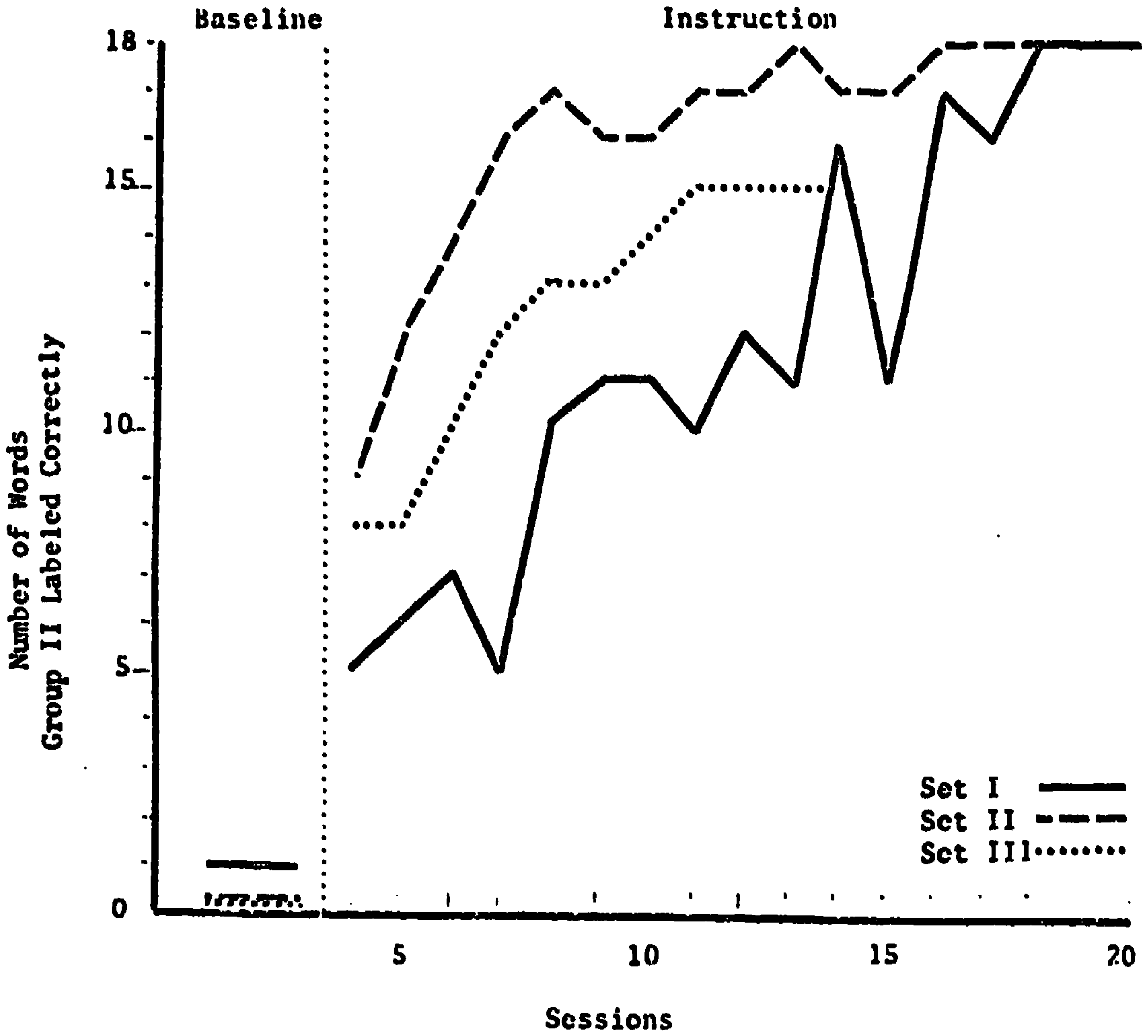


Figure 1b

Group II



(290)

Figure 2

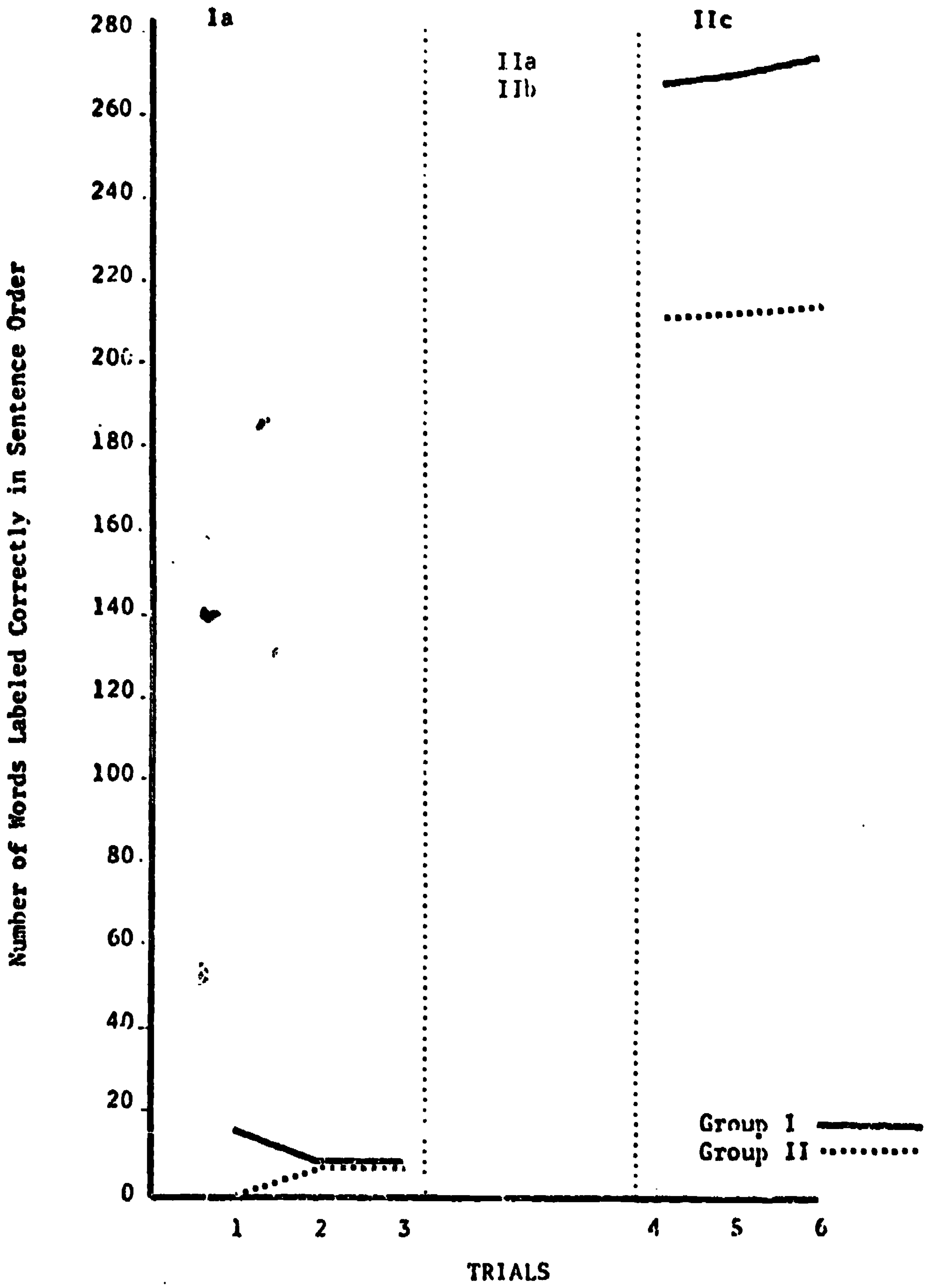

Number of Words Labeled Correctly in Sentence Order
280
260
240
220
200
180
160
140
120
100
80
60
40
20
0
Ia
IIa
IIb
IIc
1
2
3
4
5
6
TRIALS
Group I
Group II

Figure 3

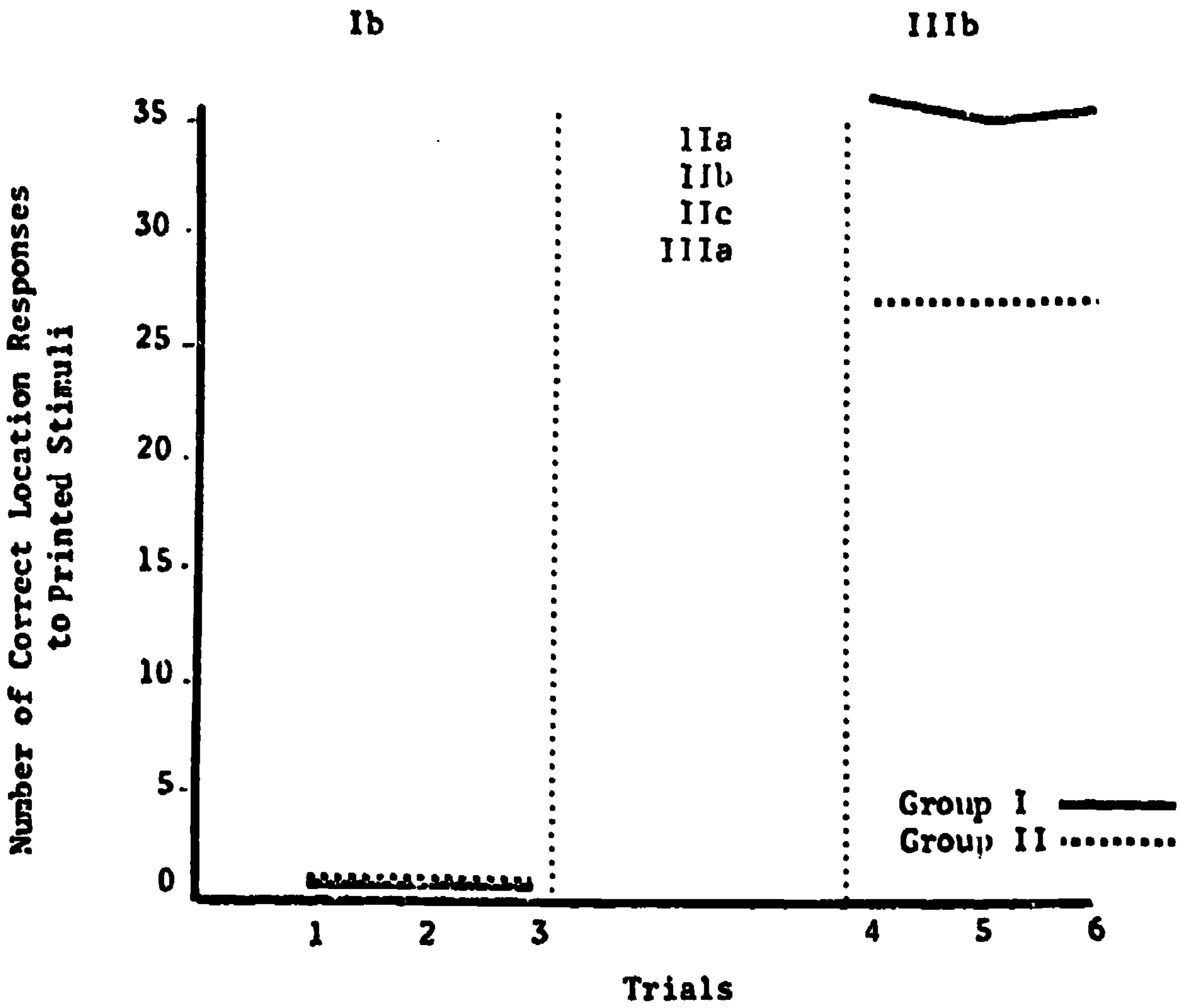
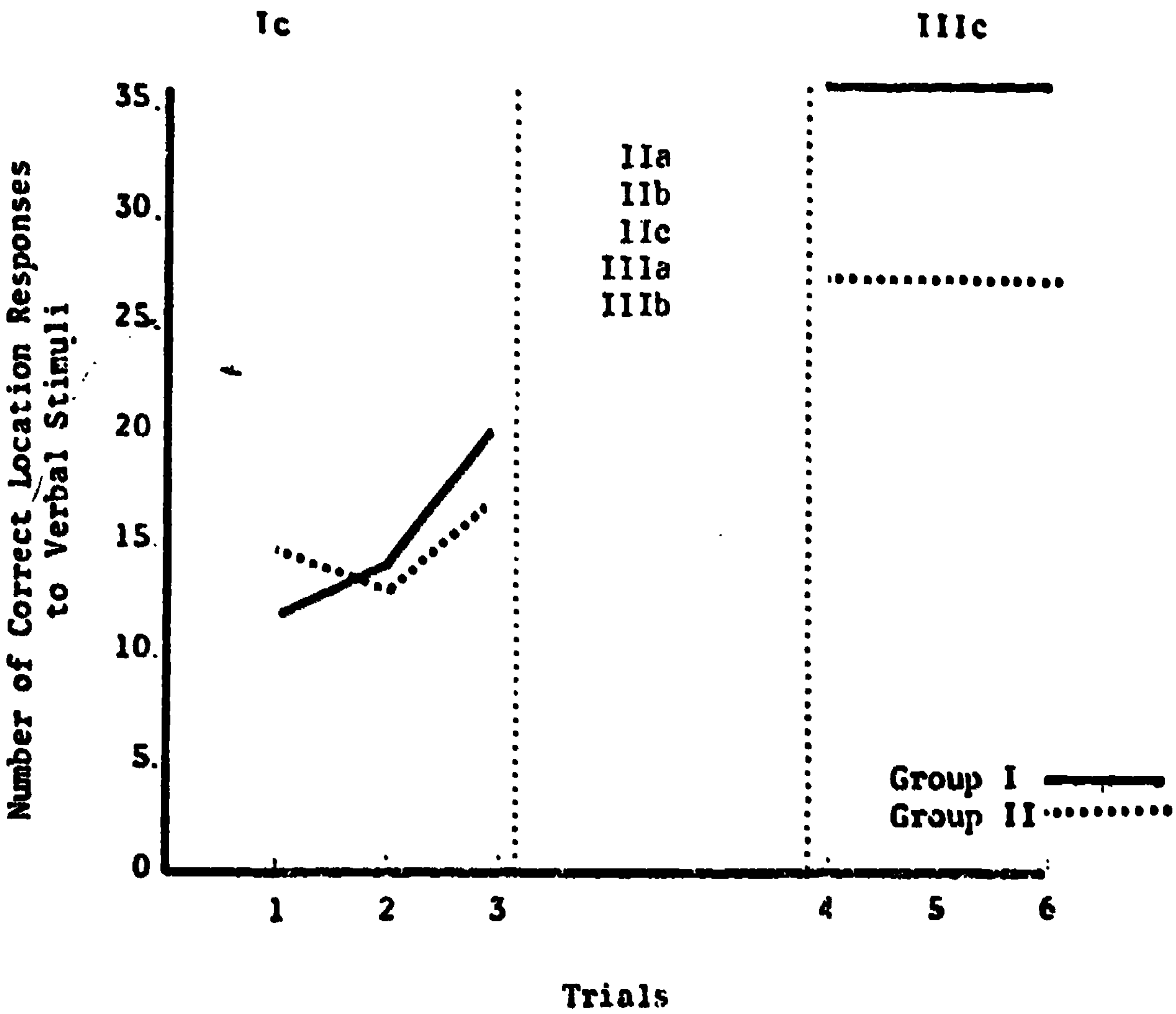

Ib
IIIb
35
30
25
20
15
10
5
0
IIa
IIb
IIc
IIIa
Number of Correct Location Responses to Printed Stimuli
Group I
Group II
1
2
3
4
5
6
Trials

Figure 4


Ic
IIIc
35.
30.
25.
20
15.
10.
5.
0
Number of Correct Location Responses to Verbal Stimuli
IIa
IIb
IIc
IIIa
IIIb
Group I
Group II
1
2
3
4
5
6
Trials

References

Baer, D., Wolf, M. M., & Risley, T. Current dimensions of applied behavior analysis. Journal of Applied Behavior Analysis, 1968, 1, 91-97.

Birnbrauer, J. S., Wolf, M. M., Kidder, J. D., & Tague, C. E. Classroom behavior of retarded pupils with token reinforcement. Journal of Experimental Child Psychology, 1965, 2, 219-235.

Bond, C. L. & Dykstra, R. The co-operative research program in first grade reading instruction. Reading Research Quarterly, 1967, 6, 5-11.

Brown, L., Hermanson, J., Klemme, H., Haubrich, P., & Ora, J. P. Using behavior modification principles to teach sight vocabulary. Teaching Exceptional Children, 1970, 2, 120-129.

Gray, B. B., Baker, R. D., & Stancyk, S. E. Performance determined instruction for training in remedial reading. Journal of Applied Behavior Analysis, 1969, 2, 255-263.

Hall, R. V., Lund, D., & Jackson, D. Effects of teacher attention on study behavior. Journal of Applied Behavior Analysis, 1968, 1, 1-12.

Kaufman, M. E. & Prehm, H. J. A review of research on learning sets and transfer of training in mental defectives. In Ellis, N. R. (ed.) International Review of Research in Mental Retardation Vol. II. New York: Academic Press, 1966.

Staats, A. W. & Butterfield, W. H. Treatment of nonreading in a culturally deprived juvenile delinquent: An application of reinforcement principles. Child Development, 1965, 36, 925-942.

Wolf, M. M., Giles, D. K., & Hall, R. V. Experiments with token reinforcement in a remedial classroom. Behavior Research and Therapy, 1968, 6, 51-64.

Lou Brown, Ph.D., Assistant Professor, Department of Studies in Behavioral Disabilities, University of Wisconsin, Madison, Wisconsin; Consultant, Madison Public Schools, Madison, Wisconsin.

Lucille Perlmutter, Teacher, Madison Public Schools, Madison, Wisconsin.

Teaching Functional Reading to Young Trainable Students: Toward Longitudinal Objectives[1]

Lou Brown, Stephen Jones, Elizabeth Troccolo,
Christine Heiser and Thomas Bellamy
University of Wisconsin and Madison Public Schools

In 1961 Butterfield wrote a paper entitled "A Provocative Case of Over-Achievement by a Mongoloid." The paper is a cursory case history of a 36 yr. old male mongoloid (E) admitted to an institution because his mother died and friends or relatives were unable to care for him in the community. As a child, this man was excluded from public school, but it appears that his mother did not consider placing him in an institution and "spent a good deal of time tutoring him and training him in good habits." Among the behaviors acquired were: playing a piano, purchasing items at a self-service store, completing housework, writing legibly, executing errands for neighbors, caring for all personal needs and making and selling pot holders. The results of a psychological examination suggested an M.A. of 5-0, an I.Q. of 28, a S.Q. of 44, fifth grade reading and spelling grade performance levels and performance at the second grade level in arithmetic.[2]

The case was deemed "provocative" because in Butterfield's words "the special tutoring and care which his mother gave to him apparently resulted in a much higher level of general life and academic achievement than generally would be expected of a mongoloid or any other person of E's M.A. and I.Q." (Butterfield, 1961, p. 446).

Those concerned with teaching trainable students have recognized the fallibility of psychological tests for some time and thus probably would not construe a marked discrepancy between test scores and the actual behavior in a person's repertoire as particularly "provocative".

This case history, however, should be provocative to educators of several other reasons. First, it appears that a parent was able to teach E to perform behaviors that many teachers of trainable students would consider "unrealistic

---

[1]This demonstration was supported in part by NICHD Grant 5 P01 HD 03352 to the University of Wisconsin Center on Mental Retardation.

[2]There are at least two additional notable cases of presumed "over achieving" mongoloid persons in the literature (Buck, 1955; Hunt, 1965). The person described by Buck was ultimately institutionalized and the future placement of Nigel Hunt apparently has yet to be determined. However, the history of these persons is similar to that reported by Butterfield in that parents, rather than schools, were primarily responsible for the development of remarkable social and academic skills.

objectives". Second, as children are no longer excluded from school solely due to their medical diagnosis, we are now expected to provide school programs for trainable students for up to fifteen years. The issue we now face is, after fifteen years of school programming, can we teach trainable students to perform at least as well as E. Third, it should be noted that as an adult E was institutionalized. Obviously, it is quite difficult to justify long term school programs if the ultimate fate of those who complete these programs is institutionalization.

Despite the opinions of some writers concerned with school programs for trainable students (Goldberg & Rooke, 1967) it is imperative that we develop and realize longitudinal objectives. Ideally, these objectives should include the development of skills necessary for independent community living in adulthood. If the trainable students now entering public school programs are to fare better than their predecessors, special educators must change their assumptions concerning the number and complexity of behaviors this level student can acquire.

Among the most basic longitudinal objectives for trainable level students is to teach them to read or to be able to learn to read the words necessary for survival in their respective communities. If this objective is to be realized, or even approximated, it is obvious that traditional conceptualizations of reading as well as traditional constrictive impositions of what trainable level students can learn must be modified.

No longer can we afford to conceptualize reading only in terms of grade levels because much of what is necessary to perform at a particular grade level is irrelevant to community functioning. On the other hand, we can no longer restrict reading for trainable students to 15 or 20 "caution" or "protective" words. A reconciliation is necessary. Trainable level students must be taught to read in such a way as to maximize their chances of survival in the community. Thus, we must find techniques that will allow them to read recipes, newspaper items, movie times, vocational information, store signs, etc.

The purpose of this paper is to demonstrate that young trainable students can learn to read in accordance with a specific definition. If the definition is tenable and the students can meet its criteria, then the long range implications are indeed encouraging.

The definition used here is essentially that used by Brown and Perlmutter (1971) with adolescent trainable students. They defined functional reading as a discrete and observable motor response to a printed stimulus. That is, if a student is presented with a printed stimulus he then has to do at least two things; he has to verbally label the printed stimulus and he has to indicate in some observable manner, that he understands the meaning of the stimulus.

This demonstration was divided into two parts. In Part I two students were taught to verbally label three dimensional objects (nouns) and verbally label the printed stimuli corresponding to those objects. Then the students were presented with a printed stimulus and asked to touch the object to which the printed stimulus referred.

In Part II the students were not only asked to label the objects (nouns) but were also asked to specify the kind of object presented (adjective-noun phrases). For example, they were required to label two different kinds of trucks (oil trucks and dump trucks). Subsequently, the students were taught to verbally label the printed stimuli corresponding to the different trucks. Finally, the students were presented with a printed adjective-noun phrase and a group of objects. They were asked to verbally label the adjective-noun phrase and then to touch the object to which the phrase referred.

Method

Subjects (Ss)

$\underline{S}_1$ was a 5 year and 9 month old female diagnosed at birth as manifesting Downs Syndrome. Psychological reports containe. test scores suggesting an MA of 2-9 and an IQ of 49. $\underline{S}_2$ was a 5 year old male diagnosed at birth as manifesting Downs Syndrome. Psychological reports contained test scores suggesting an MA of 2.4 and an IQ of 49.

$\underline{S}_1$ has always lived with her college-educated parents in their middle-class home. $\underline{S}_2$ was placed in an institution shortly after birth, and remained there until he was placed in the foster home of the parents of $\underline{S}_1$ at age two. When $\underline{S}_2$ was in the institution, it was communicated to the foster parents that he would not be able to walk or talk until he was about 5 years old.

Both $\underline{S}_1$ and $\underline{S}_2$ were enrolled in a public school program for trainable retarded students for a total of 2 months before this program was initiated.

Materials

The objects used in Part I were arbitrarily selected from objects generally present in classrooms for young children: paper cup, drinking straw, crayon, toy truck, ball, carton of milk, paper napkin, shoe, pencil, pants, mittens, and boot.

The nouns representing each of the 12 objects were divided into four 3-word sets and printed on 7.6 cm x 2.5 cm flashcards: cup, boot, pencil (Set I), truck, crayon, napkin (Set 2), straw, pants, milk (Set 3), ball mitten and shoe (Set 4).

The following 12 objects were used in Part II: red crayon, blue crayon, container of chocolate milk, container of white milk, toy dump truck, toy oil truck, big paper cup (Ht=7.6 cm), little paper cup (Ht=2.5 cm), plastic straw, paper straw, football and baseball. The twelve two-word adjective-noun phrases representing these objects were divided into four sets of three and printed on 7.6 cm x 38.2 cm flashcards: football, baseball (football and baseball were presented as compound words), big cup (Set 5), little cup, dump truck, oil truck (Set 6), plastic straw, paper straw, blue crayon (Set 7), red crayon, chocolate milk and white milk (Set 8).

All teaching was conducted at a table in a corner of the classroom by the classroom teacher (T) or a teacher-aide while the four remaining students in the class were involved in other activities. Data sheets were constructed that provided easy recording of responses to each stimulus, and candy or cereal were used as consequences for correct responding. Testing and teaching sessions were conducted from 8:30 - 9:00 a.m. and from 1:30 - 2:00 p.m. daily. Due to differences in performance rates between Ss and across materials, the number of trials per session were not constant.

Part I

Baselines

Three different baselines were obtained in Part I. The first baseline determined how many of the 12 objects each S could verbally label correctly. When Ss were seated at the table T alternately presented 1 of the 12 objects to each S and said "What is this?". If an S responded correctly, or incorrectly T said "Thank you" and recorded the response. This procedure was followed until each S had an opportunity to label each of the 12 items on three consecutive occasions.

The second baseline determined how many of the 12 printed words Ss could verbally label correctly. When Ss were seated T alternately presented one of the 12 words to each S and said, "What does this word say?". All responses were recorded; both correct and incorrect responses were followed with "Thank you". This procedure was followed until each S had an opportunity to label each of the 12 words on three consecutive occasions.

The third baseline determined if Ss could label the words and then touch the objects the words represented. T randomly placed the 12 objects on the table and then alternately presented the 12 printed words to each S and said, "What does this word say?". If S did not label the word correctly, T said "Thank you". If S labeled the word correctly T said, "Good, now put your finger on it."

Teaching Procedures

Teaching Object Labeling - The following procedures were used to teach Ss to correctly label the objects they were unable to label in the baseline period. T presented one object to S_1 and said, "What is this?" (pointing to the object). If S_1 responded correctly T recorded the response and said "Good" and presented S_1 with a piece of candy or cereal. If S_1 did not respond or responded incorrectly T recorded an error, modeled the correct label (e.g. "That is a ball") and immediately asked S_1 to match the label she modeled. If S matched the modeled label T said "Good" but did not offer the candy or cereal. T continued to model the correct label until S_1 matched it. S_2 was then presented with an object that he could not label in the baseline period. This procedure was followed (using all 12 objects) until both Ss labeled the objects they were unable to label in the baseline period on three consecutive presentations.

Teaching Word Labels - The procedure used to teach Ss to correctly label the four sets of words was essentially that used by Brown and Perlmutter (1971) and Staats and Butterfield (1965) in which T presented a word card, modeled the correct label, instructed S to match the label provided and reinforced S when he did so. The specific steps were as follows:

Step I: T presented the first card in Set I to both Ss and said, "Do you see this word?" (T pointed to the card.) This word says ___. T then presented the second and third cards in Set I and modeled the appropriate labels. This procedure was followed until T modeled the labels to each word in Set I on 3 occasions.

Step II: T presented the first word in Set I to S_1 and said "What does this word say?" and recorded the response. If S_1 provided the correct label she was given a piece of candy or cereal. If S_1 did not provide the correct label, T modeled the correct label, asked S_1 to match the label she provided and said "Good" when she did so. The second word in Set I was then presented to S_2, the third word to S_1 etc. This procedure was followed until S_1 and S_2 correctly labeled each of the three words in Set I on the first presentation of three consecutive trials.

When S_1 and S_2 reached criterion on one set of words, a different set was introduced. However, before a new set was introduced, the words in the previously learned sets were reviewed. The review consisted simply of presenting the previously learned words to each S and asking for the correct labels. Incorrect labels were corrected by T.

Teaching Functional Reading

Once Ss were taught to label the objects and the corresponding words, the 12 objects were displayed on the table. Ss were then presented with a word, asked to label that word and to touch the object to which the word referred. If, for example, S_1 responded correctly, T gave her a piece of candy or cereal, and presented the next word to S_2. If S_1 responded incorrectly T said "No, that is not right", and asked S_2 if he knew what the word was. If S_2 responded correctly T told S_2 to point to the appropriate object. If S_2 again responded appropriately he was given a piece of candy or cereal. If neither S responded correctly T modeled the correct responses and asked S_1 to match them. If she did, T said "Good" and presented the next word to S_2.

This procedure was followed until each S correctly labeled the 12 words and pointed to the appropriate objects during three consecutive trials.

Results

The results of Part I are presented in Figure 1. As can be discerned from Figure 1A S_1 and S_2 correctly labeled 9, 10 and 11 and 6, 7 and 7 of the objects respectively during the baseline period (trials 1, 2 & 3). Only three teaching trials were necessary for S_1 to reach criterion. However, at trial 10 a performance decrement was noted. As it had been established that the correct responses were in her repertoire, it was not considered necessary to institute procedures that would regain 100% correct responding. It is quite probable that S_1 was capable of labeling the 12 different objects and that the procedures provided incentives to perform. Twelve teaching trials were necessary for S_2 to reach criterion. In addition, it appears that S_2 was able to label 7 of the 12 objects and the procedures resulted in teaching him the remaining 5 labels.

During the word labeling baseline period neither S emitted a correct labeling response. As can be discerned from Figure 1B, S_1 and S_2 made 7, 8, 7 and 31, and 37, 16, 10 and 58 errors respectively before reaching criterion on the four three-word sets (Sets 1, 2, 3 & 4).

During the functional reading baseline period (Figure 1C, trials 1, 2 & 3) neither S could verbally label any of the 12 printed words and thus could not touch the correct objects. After Ss were taught to label the 12 objects and words, they were again asked to label the words and touch the appropriate objects. In trial 4, the number of correct functional reading responses of both S_1 and S_2 increased dramatically over the baseline period, and they reached criterion in trials 13 and 15 respectively.

Part II

Baselines

Three different baselines were obtained in Part II. The first baseline determined how many of the 12 objects each S could label correctly. The only difference between this baseline and the first baseline obtained in Part I was that here if S labeled an object as for example "a truck" T said "Yes, that is a truck, but what kind of a truck is it?" A response was considered correct only if the adjective as well as the noun was provided.

The second baseline determined how many of the 12 printed adjective-noun phrases each S could label. The only difference between this baseline and the second baseline obtained in Part I was that if S labeled one of the two words on a card T said "Yes, that word says ___ (e.g., truck) but what does the other word say?" Responses were considered correct only if the adjectives as well as the nouns were offered.

The third baseline determined if Ss could label each adjective-noun phrase and then touch the objects referred to in the phrases. The same procedures used to establish the third baseline in Part I were used here.

Teaching Procedures

The same procedures used to teach object labeling, word labeling and functional reading in Part I were used here. However, the following departures were necessary: when teaching object labeling and word labeling Ss were taught to report the adjective-noun phrases; and when teaching functional reading Ss were required to label the adjective-noun phrases and point to the particular object to which the phrases referred.

Results

The results of Part II are presented in Figure 2. As can be discerned from Figure 2A, S_1 correctly labeled 4, 5, and 9 objects correctly in the baseline period (trials 1, 2 and 3) while S_2 labeled 7, 5 and 7 objects correctly during the baseline period. When the teaching procedures were initiated S_1 reached criterion at trial 10, and S_2 reached criterion at trial 12.

During a three trial word-labeling baseline period it was established that neither S could verbally label any of the 12 adjective-noun combinations. As can be discerned from Figure 2B, S_1 and S_2 made 1, 4, 6 and 3, and 8, 15, 25 and 7 errors before reaching criterion on the four sets of adjective-noun phrases respectively.

During the functional reading baseline (Figure 2C, trials 1, 2 & 3) Ss could neither verbally label the adjective-noun phrases nor point to the objects to which the phrases referred. After Ss were taught to label the objects and the adjective-noun phrases, they were again asked to read the 12 cards. At trial 4, the number of correct functional reading responses of both S_1 and S_2 increased dramatically over the baseline period, and they reached criterion in trials 8 and 10 respectively.

Discussion

Functional reading was defined as an observable motor response to a printed stimulus. In accordance with this definition the two students learned to read six nouns and twelve adjective-noun phrases.

In Part I each student was taught to verbally label the objects he or she could not label correctly during the object labeling baseline trials. Subsequently, both students were taught to verbally label printed words that represented the three dimensional objects. The words were arranged in sets and errors to criterion were used as a dependent measure in order to discern whether a sight word learning set could be developed (Brown, et al., 1970). That is, it was anticipated that each student would make fewer errors to criterion as new sets of words were introduced. Inspection of Figure 1B suggests that S_2 made fewer errors to criterion across Sets 1, 2 & 3 but made a relatively large number of errors before reaching criterion on Set 4. The acquisition pattern of S_1 is different in that she made virtually the same number of errors in Sets 1, 2 & 3 but made a relatively large number of errors before reaching criterion on Set 4. Apparently neither student developed a sight word learning set.

There are at least two hypotheses that might account for the difficulty both students had reaching criterion on Set 4. First, the words in Set 4 might have been inherently more difficult than the words in Sets 1, 2 & 3. Visual inspection of the words in the four Sets does not suggest, at least to the writers, that the words in any set might be more difficult than the words in any other set. A second hypothesis relates to the possible presence of interfering variables operating in the learning environment. That is, fatigue, satiation or any number of other factors might have been operating when Set 4 was being presented.

When the students acquired the verbal labels of the objects and the words, it was expected that when presented with a word and asked to label it, they would cognitively associate the word with the three dimensional object and demonstrate this association by touching the object. Inspection of Figure 10 suggests that some degree of association between the words and the corresponding objects might have occurred, but the associations were not perfect. Sometimes a student would label a word correctly but point to the wrong object and vice versa. Thus, correction procedures were necessary to teach correct responding.

The performance patterns of each student in Part II are quite similar to the patterns observed in Part I. That is, during the reading baseline period neither student made a correct reading response. After they learned to label the different kinds of objects and the printed adjective-noun phrases, a dramatic increase in the number of correct reading responses was observed. However, it should be noted that in Part II fewer trials were required to teach object labeling, fewer errors per set were made before the labels of the printed adjective-noun phrases were acquired, and fewer criterion trials were necessary before the reading criterion was reached.

One crucial question that must be confronted is whether the procedures will generalize across other students. Currently, the procedures are being used at a nursery school program for preschool retarded children, on an institutional ward as part of a ward development project, and with several classmates of the students taught here. While the objects, words and acquisition rates are different with the students in these three settings, evidence thus far indicates that at least 10 other young trainable children have reached criterion on Part I of the program.

A second crucial question relates to the next step in the program. One option is to continue to teach differential responding to adjective-noun phrases until other components of reading are imperative. A second option is to attempt to introduce verbs and other components of the reading process. Within the framework of the definition of functional reading the development of verb forms is both challenging and exciting. Role playing, special films, and teacher demonstrations might be used to model actions that could be paired with printed stimuli. For example, the teachers could use procedures developed elsewhere (Brown, Bellamy, Tang & Klemme, 1971) to teach students to respond correctly to verbal directions ("Put the red crayon in the dump truck"). Then the teachers could use the flash card drill to teach the students to verbally label the printed words. Finally, she could give the students a written direction and ask them to carry it out (Brown & Perlmutter, 1970).

In addition, we must confront the longitudinal issue of how much trainable students can learn. In our view what trainable students can learn is a function of the technology and ingenuity available to the teacher. Admittedly the definition of reading and the learning principles used here are rather circumscribed; however, even within the limits of the definition it might be possible to teach trainable level students behaviors that historically have been unavailable to them. That is, approximately 50 instructional hours were used in this entire program to demonstrate that these students, at age 5, seemingly have already progressed beyond the "protective or caution word" reading level (Goldberg and Rooke, 1967). If this and related programs can be expanded in quantity and complexity with equal success, then projections about what behaviors will be in the repertoire of these students after 15 years of public school programming are exciting. For example, upon adulthood, once a series of motor behaviors is associated with printed stimuli it does not seem unreasonable to expect that these students will be able to make appropriate responses to the words on a waitress' order blank, label the words and numbers on an envelope and deliver the envelope to a particular house on a particular street, complete printed orders for many of the time consuming and repetitive tasks in clerical settings or even teach other students to read the words they have learned (Brown, Klemme & Fenrich, 1970).

Finally, it should be emphasized that the data is essentially correlational and that until the program is repeated with more stringent controls (e.g. control groups, multiple baseline designs, systematic replications across subjects) the relationship between the procedures employed and the changes in the behavior of the students can only be considered tentative.

References

Brown, L., Bellamy, T., Tang, P. and Klemme, H. A procedure for teaching trainable students to follow verbal directions. Unpublished manuscript, University of Wisconsin, 1971.

Brown, L., Hermanson, J., Klemme, H., Haubrich, P. and Ora, J. Using behavior modification principles to teach sight vocabulary. Teaching Exceptional Children, Spring, 1970, p. 120-128.

Brown, L., Klemme, H. and Fenrich, N. Trainable retarded students teach trainable retarded students. Unpublished manuscript, University of Wisconsin, 1970.

Brown, L. and Perlmutter, L. Teaching functional reading to trainable level retarded students. Education and Training of the Mentally Retarded, February, 19[illegible].

Buck, J. N. The [illegible]: An unusual mongoloid. In A. Burton and R. E. Harris, Clinical studies of personality, Harper & Row, 1955, pp. 455-461.

Butterfield, E. A provocative case of over-achievement by a mongoloid. American Journal of Mental Deficiency, 1961, 66(3), 444-448.

Goldberg, I. and Rooke, M. Research and educational practices with mentally deficient children. In Haring, N. and Schiefelbusch, R., Methods in special education, New York: McGraw-Hill, 1967, pp. 112-136.

Hunt, N. The world of Nigel Hunt: The diary of a mongoloid youth. New York: Garrett, 1967.

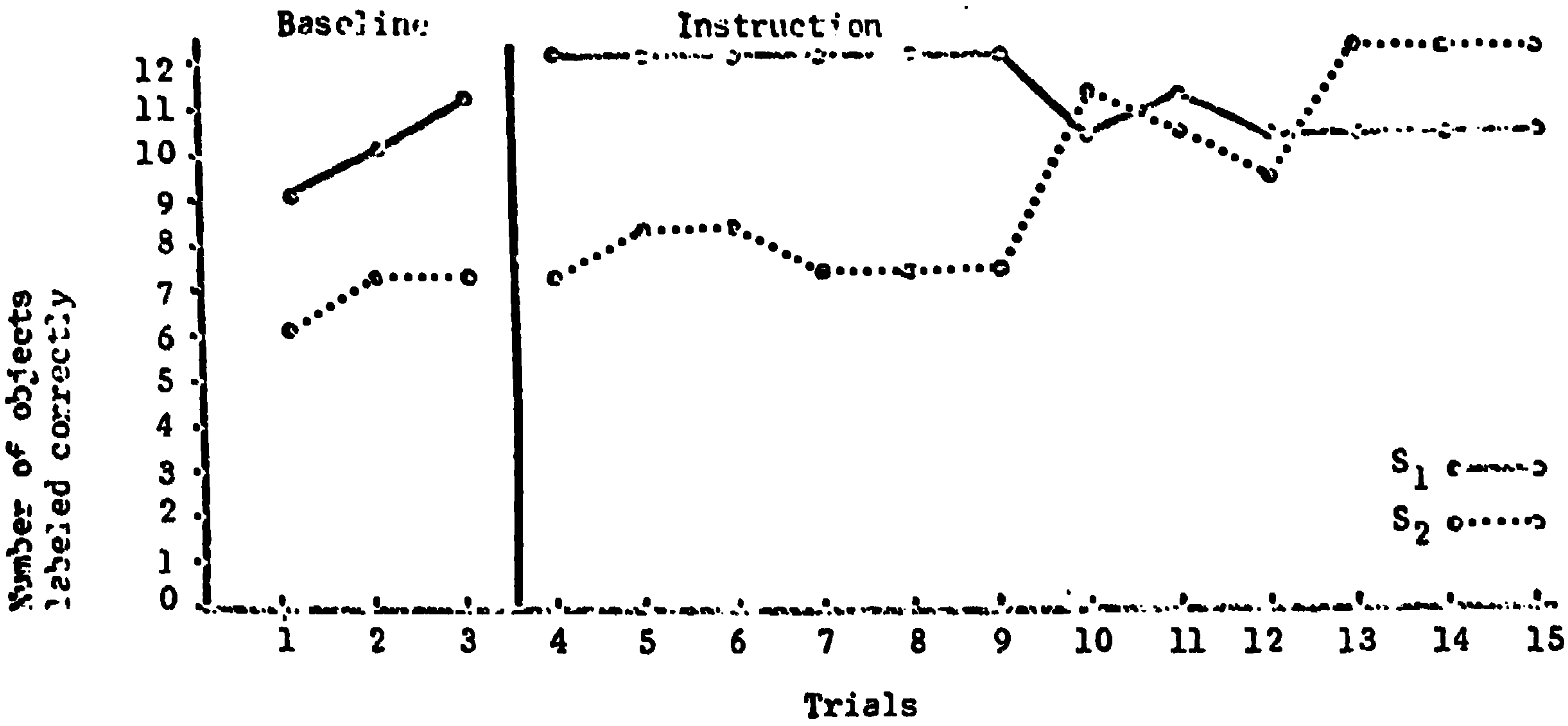
Staats, A. and Butterfield, W. Treatment of non reading in a culturally deprived juvenile delinquent: an application of reinforcement and principles. Child Development, 1965, 36, 925-942.

List of Figures

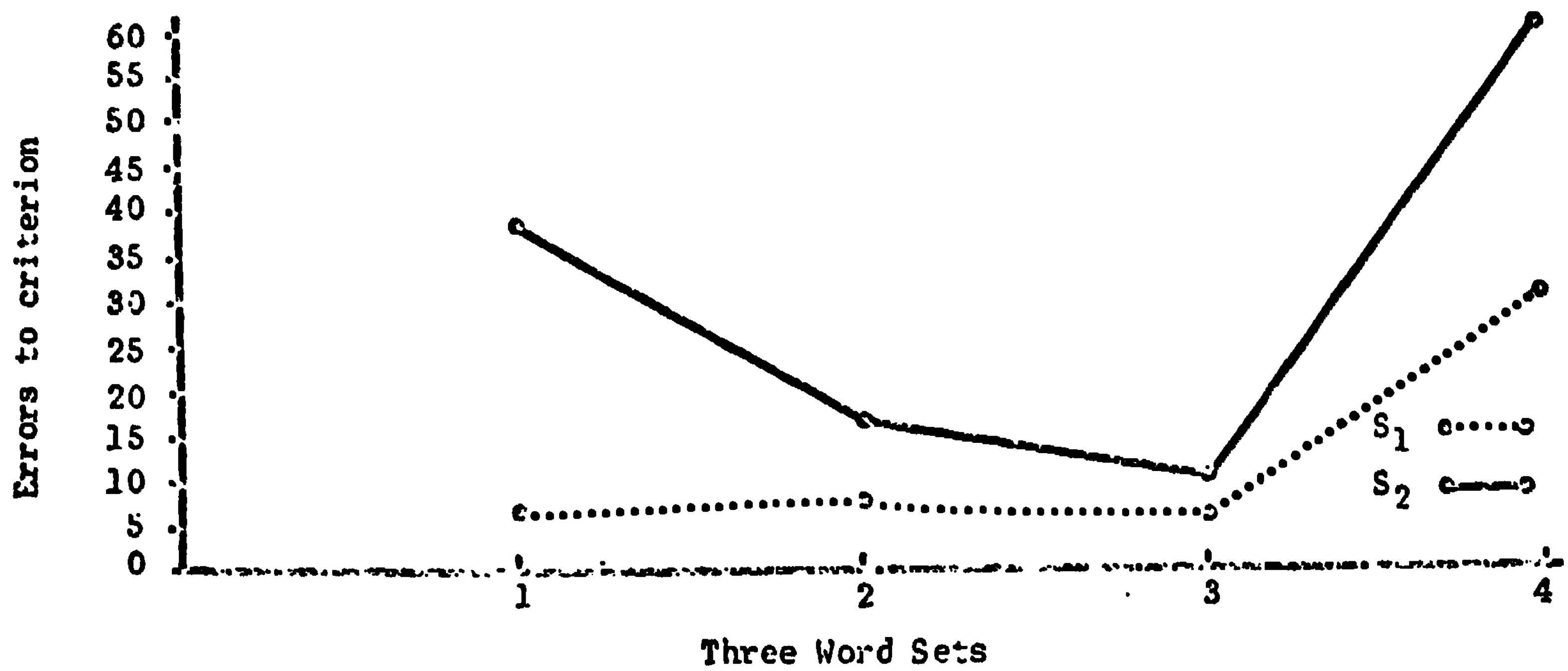
Figure 1

Figure 2

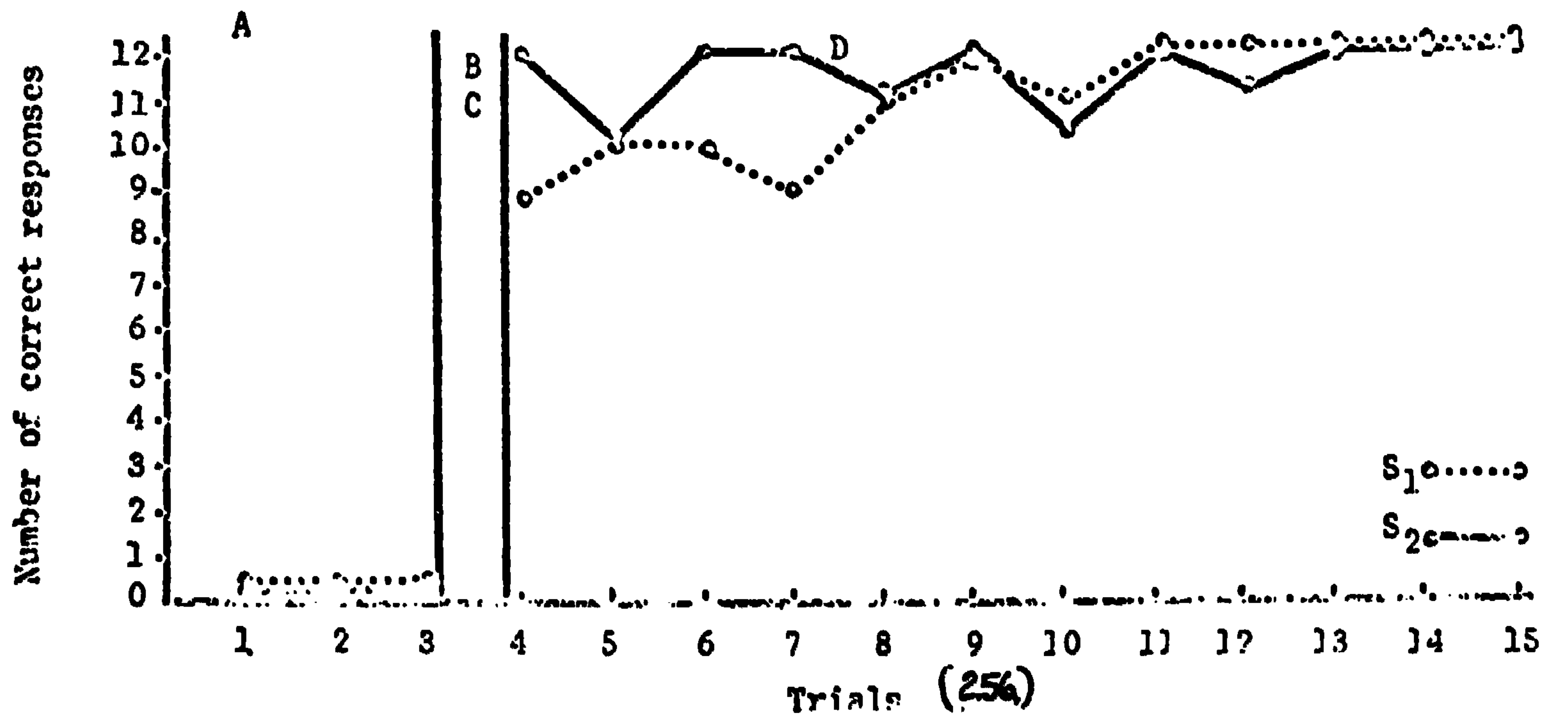
1A


Baseline
Instruction
Number of objects labeled correctly
12
11
10
9
8
7
6
5
4
3
2
1
0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
Trials
S_1
S_2

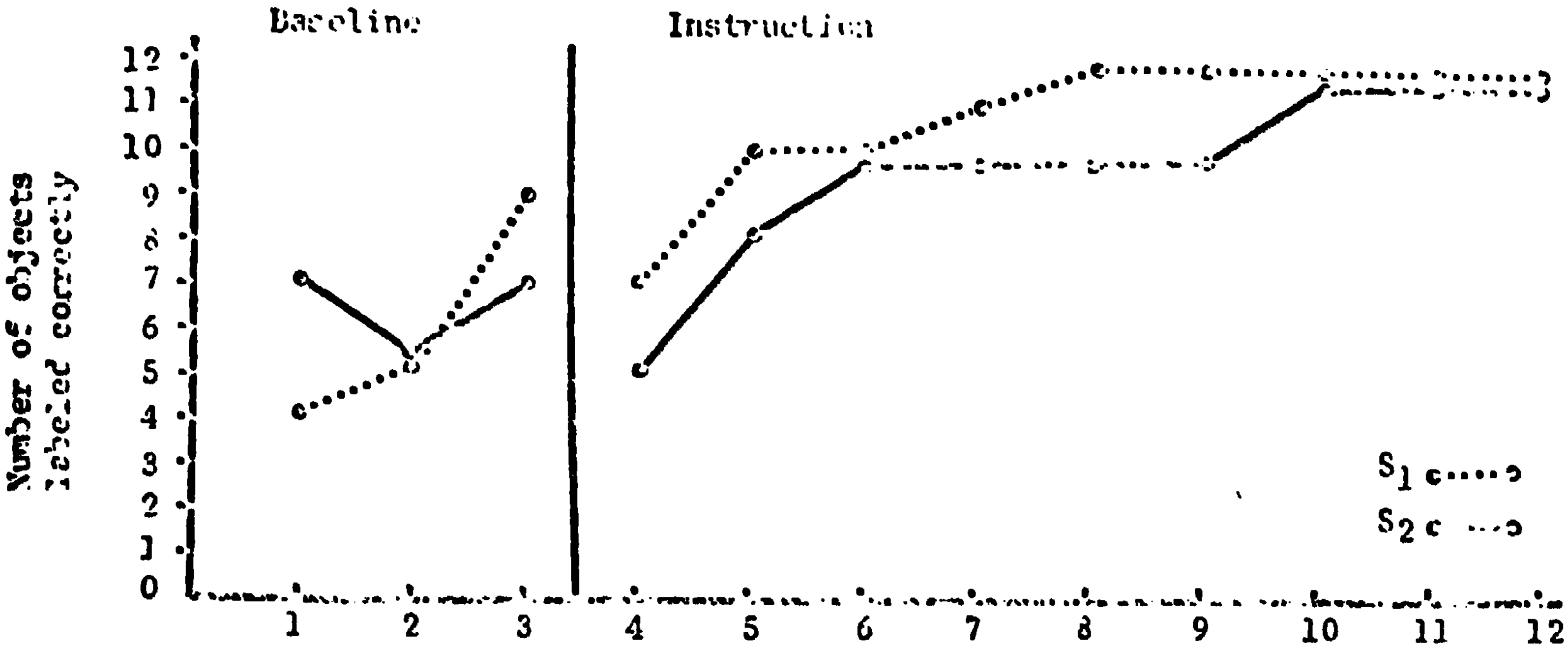
1B


Errors to criterion
60
55
50
45
40
35
30
25
20
15
10
5
0
1 2 3 4
Three Word Sets
S_1
S_2

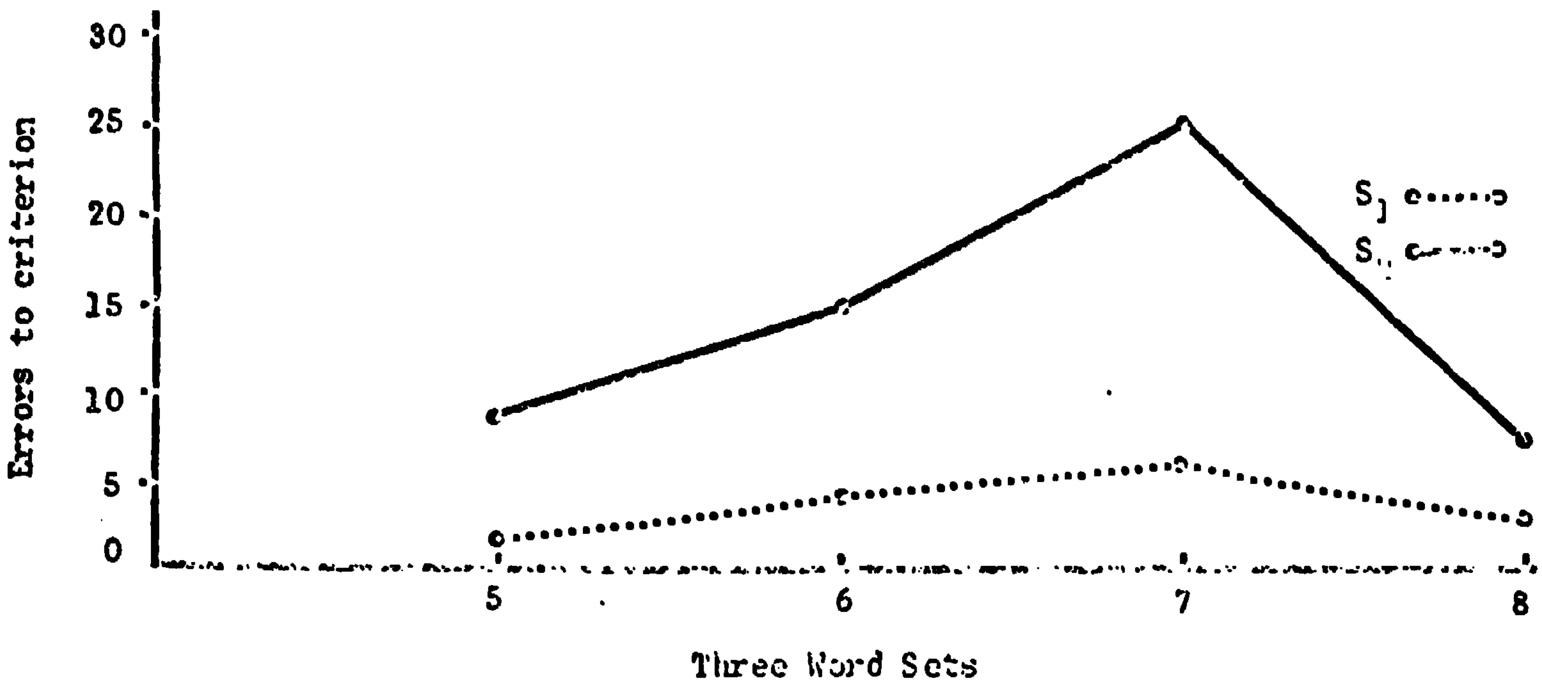
1C


A
B
C
D
Number of correct responses
12
11
10
9
8
7
6
5
4
3
2
1
0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
Trials
S_1
S_2

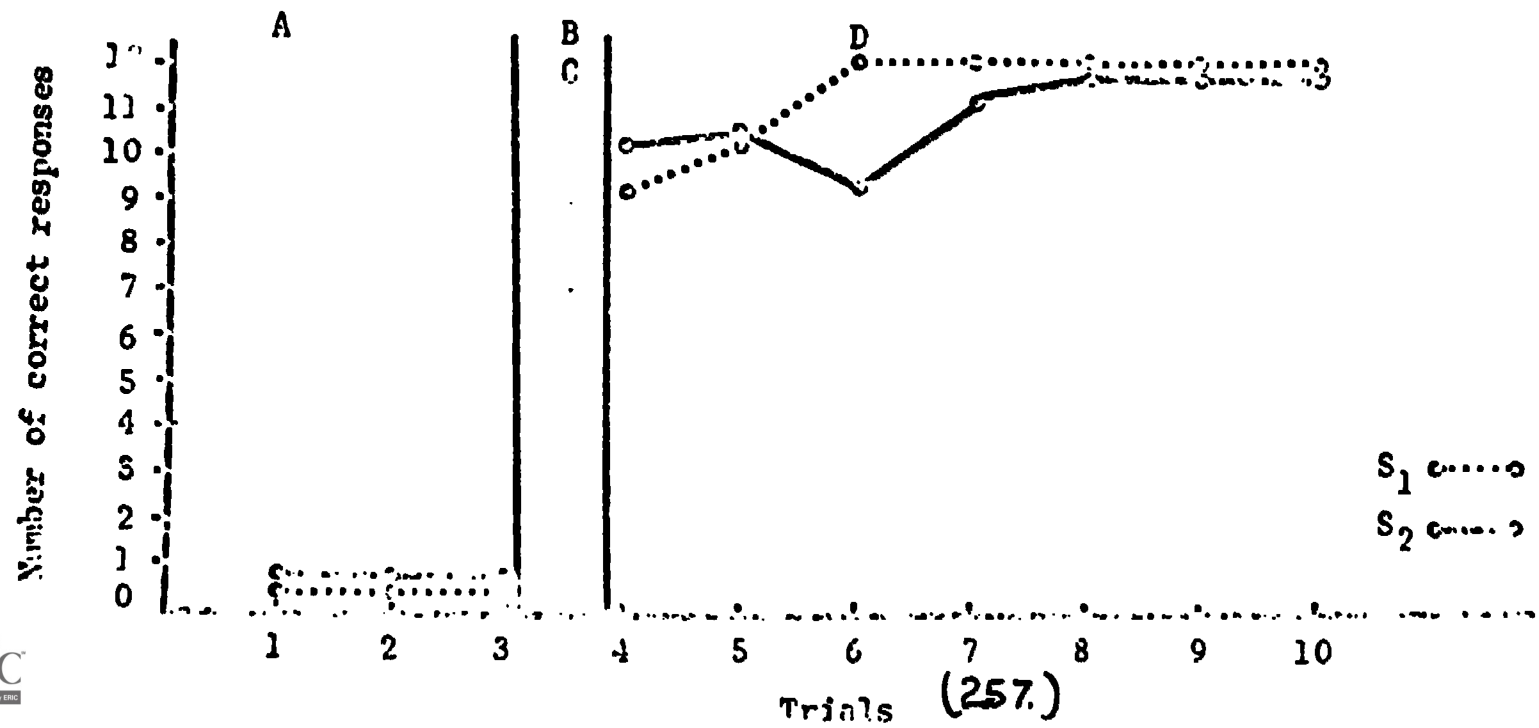
2A


Baseline
Instruction
Number of objects labeled correctly
S_1
S_2

2B


Errors to criterion
S_1
Three Word Sets

2C


A
B
C
D
Number of correct responses
S_1
S_2
Trials

DEVELOPMENT OF SELECTED PRE-READING SKILLS IN YOUNG TRAINABLE STUDENTS

Lou Brown, Tom Bellamy, Judy Bancroft and Edward Sontag[1]

University of Wisconsin and Madison Public Schools, 1971

Most students in public schools learn to read well enough to function effectively in a community environment. How these students learn to read has been, and probably will remain, replete with extremely diverse philosophically and emotionally laden explanatory positions. The fact is, nonetheless, that regardless of the training of the teacher, the method, the materials, the school building, etc., most students learn to read.

Trainable level retarded students do not learn to read regardless of the methods, materials, etc. With extremely few exceptions (e.g., Hunt, 1968) we are unaware of trainable level retarded students who have learned to read well enough to function effectively in a community environment.

Usually, when the general area of reading is discussed (Spache & Spache, 1969) such terms as language development, wealth of experiences, incidental learning, mental processes, generalization ability, ability to abstract, etc. are considered important, if not necessary, prerequisites for the development of a substantial reading repertoire. Unfortunately, trainable level retarded students are almost defined by their language deficits, their paucity of developmental experiences, their inability to learn incidentially, their questionable "mental processes", their inability to generalize, and their inability to deal effectively with abstractions.

The teacher of trainable students is, therefore, in a rather difficult instructional position. On one hand she has been told that trainable students will not become literate (Dunn, 1963; Goldberg & Rooke, 1968). On the other hand she is aware that in order for her to make a substantial change in the historical life style of her students (i.e., teach her students to function in a community rather than a residential institution), she must teach them how to read.

The teacher of the trainable retarded who assumes that her students will ultimately be confined to residential institutions or remain at home in the custody of ever-present parents, can exclude reading from her curriculum, or confine her instruction to differential responding to basic caution words (e.g., "poison", "stop").

---

[1]The investigation was supported in part by funds from the Wisconsin Alumni Research Foundation, and in part by NICHD Grant 5 P01 HD 03352-02 to the University of Wisconsin Center on Mental Retardation.

The teacher who assumes that her students can ultimately function effectively in a community setting and assumes that she can make a substantial contribution to the development of the required skills is in a different position. This teacher is aware of two things. First, she is aware that in order for her students to function effectively in a community setting they will have to possess a complex and relevant reading repertoire. Second, she is aware that, at this point, there are no places to go, no books to read, and no one who can tell her <u>how</u> to teach her trainable level students to read.

During the past several years we have made a number of attempts to develop instructional procedures (methods) that might result in trainable students acquiring a functional reading repertoire (Brown, Hermanson, Klemme, Haubrich, & Ora, 1970; Brown & Perlmutter, 1971; Brown, Fenrick, & Klemme, 1971; Brown, Jones, Troccolo, Heiser, & Bellamy, 1971).

The procedures we have used are described in detail in the references cited above. In general we have attempted to define reading as a series of behaviors and use principles of applied behavior analysis (Risley & Baer, 1971) to develop these behaviors. In addition, we have used what may loosely be called a whole word approach. That is, we have taught discrete verbal and motor responses to printed words.

Whether it is possible to teach trainable students to read all the words they need to know by teaching discrete verbal and motor responses has not been determined. It should be noted, however, that Staats & Butterfield (1965) used the whole word method to teach a retarded student who failed in all other school programs to verbally label over seven hundred different words. It seems to us, however, that while evidence may ultimately confirm that the whole word method is most effective, other approaches now warrant empirical investigation.

The approach investigated in this paper is similar to the whole word approach described above in that several pre-reading skills were behaviorally defined and principles of applied behavior analysis were used to teach the behaviors. The behaviors of concern were the verbal labels of the letters of the alphabet as they occurred in words, rather than the verbal labels of whole words.

The rationale for this approach is that if a student can be taught to label the letters in the alphabet, combine different letters to form different sounds, etc., he might ultimately decipher whole words that he had never been taught.

The program consisted of teaching the following five tasks:

I. Imitating letter sounds;
II. Visually discriminating letters that match samples;
III. Verbally labeling letters;
IV. Pointing to letters in response to verbal cues;
V. Verbally labeling letters as they occur in words.

Obviously, the ability to verbally label letters as they occur in words is not the only pre-reading or word attack skill necessary for successful reading. However, if trainable students can be taught to verbally label letters as they occur in words, the issue then becomes that of what to teach next rather than what to teach instead.

Method

Students (Ss) and Setting

The three Ss ranged in age from 11-11 to 12-1 ($\bar{X}$=12.0) in IQ from 35 to 42 ($\bar{X}$=38) and had been enrolled in public school programs for trainable students from 4 to 5 years ($\bar{X}$=4.7). All Ss were diagnosed as manifesting Downs Syndrome.

The entire teaching program was conducted by a student teacher (T) during scheduled classroom activities.

Materials

Conduction of the teaching program involved use of the following materials:

1) Two 8½" x 11" sheets of 13 match-to-sample problems, including one problem for each letter of the alphabet (See attached sample).

2) Three sheets of 8½" x 11" construction paper with a square exactly the size of the match-to-sample problems cut out of the center (Cover Sheets).

3) Twenty-six 3" x 5" index cards (Letter Cards) on each of which a low-case letter was printed.

4) Nine 3" x 5" index cards (Word Cards) on each of which one of the following words was printed in low case letters: vase, fox, pencil, ghost, yellow, desk, queen, and zebra. All 26 letters appear at least once in these words.

5) The data sheet used for Tasks 1, 2, 4 and 5 contained a column for each S and a row for each letter in the alphabet. An immediate record of Ss correct and incorrect responses was thus maintained.

6) The data sheet used for Task 3 was constructed so that sets of three letters appeared in rows, while columns represented the number of times the set had been presented.

Teaching Procedures

Baseline. Measures of performance on all tasks were taken prior to the outset of instruction on any task. The presentation of instructional materials was constant during baseline and teaching conditions, so the procedures used in the two conditions will be presented simultaneously for each task.

Imitating letter sounds (Task I). Baseline measures of performance were taken in the following manner:

> T instructed Ss to, "Repeat the letter I say." T then voiced a letter for the first S to repeat and recorded whether S's response was correct. A different letter was then presented to the next S, etc., until all Ss had responded to all 26 letters. No feedback concerning accuracy was given during the baseline period.

Inasmuch as all Ss responded perfectly to Task I during the baseline period, no teaching procedures were employed.

Visually discriminating letters that match samples (Task II). Baseline measures of performance were taken in the following manner:

> T gave each S 1 of the 2 sheets of match to sample problems and one cover sheet. Ss were instructed to "Put the cover sheet on the paper so you can see only one problem. Draw a line from this letter (pointing to the single letter on the left) to the one over here that is the same (pointing to the three choices on the right.)" T modeled the desired response on a problem different from those presented Ss, and asked Ss to, "Begin work. Make sure you do every problem." The second problem sheet was given each S as soon as the first was completed. No indication of the accuracy of any response was given.

The same procedures were used in teaching except that a sheet was corrected in Ss' presence as soon as it was completed. Large red check marks were placed beside every correct problem. Every correct problem was praised by T, and other Ss were encouraged to praise or applaud. When a problem was incorrect, T asked S to "Find the letter that looks like this." When S responded correctly, T praised him and aksed him to work a duplicate problem.

Verbally labeling letters (Task III). Baseline measures of performance were taken in the following manner:

> T presented one of the 26 Letter Cards to an S and asked, "What is this letter?" The response was recorded with no indication of accuracy, and a different Letter Card was presented to the next S. The procedure was continued until each S had responded to all 26 Letter Cards.

Letters which an S did not label correctly in both baseline presentations were alphabetically assigned to sets of three letters. During teaching, each S was instructed with one set until he correctly labeled all three letters on three consecutive presentations. Instruction in another set followed the attainment of this criterion. The Letter Cards in a particular set were presented as above, except that priase from T and other Ss followed each correct response. S was also able to see whether T recorded a "+" or "-" on the data sheet. When S's response was incorrect, he was first asked to "Try again," "Make sure," etc. If the ensuing response was still incorrect, T modeled the correct response or asked another S to model the response. The initial instruction, "What is this letter?" was then repeated, consistently producing the desired response.

Pointing to letters in response to verbal cues (Task IV). Baseline measures of performance were taken in the following manner:

> The 26 Letter Cards were attached in alphabetical order to the classroom blackboard. T instructed S to "Point to the letter (Q)". The response was recorded with no indication of accuracy, and an instruction involving a different letter was presented the next S. The procedure was continued for 2 trials in which all Ss responded to all 26 Letter Cards.

The same procedures were used in teaching, except that the accuracy of each response determined the consequences of that response. Correct responses were followed by praise from T and the other Ss. Incorrect responses were followed first by T's instruction to "Try another card;" "You can do better than that," "Look a little harder;" etc. If S's second response was also incorrect, T asked another S to model the correct response, and then repeated her initial instruction, "Point to the letter (Q)."

Verbally labeling letters as they occur in words (Task V). Baseline measures of performance were taken in the following manner:

> T presented one of the Word Cards to an S and asked him to "Point to the letters in this word and tell me their names." Each letter voiced was scored as correct or incorrect without feedback. A different Word Card was then presented to the next S. The procedure was continued until each S had responded to all 9 Word Cards. Some letters appear more than once in the set of words. S's response to the first appearance of each letter was recorded.

The same procedures were used in teaching except that the accuracy of each response determined the consequences of that response. When S correctly labeled all letters on the card in sequence, he received praise from T and the other Ss. When a letter was incorrectly labeled, T asked S to "Try again." If the second response was also incorrect, another S was asked to model the desired response, and S was asked to label all the letters on the card once more.

Results

During each measurement and teaching trial, each S could make from 0 to 26 correct responses to a set of instructional materials. The 3 Ss could thus make a total of 78 correct responses during each trial. Criterion performance for Tasks I, II, IV & V was defined as two consecutive trials in which 78 correct responses were made. Criterion performance for Task III was defined as three consecutive correct labeling responses to each set of three letters.

During the baseline period Ss averaged 78 correct responses to Task I, 75 correct responses to Task II, 41.5 correct responses to Task III, 29 correct responses to Task IV, and 46 correct responses to Task V. Inasmuch as criterion performance in Task I was attained during the baseline period, no further measurement or teaching of this task was employed (Figure I-A).

Visually discriminating letters that match samples (Task II) was taught during Trials 3-6. Criterion performance was reached in Trials 5 and 6 (Figure I-B).

Verbally labeling letters (Task III) was taught by presenting sets of three letters and recording the number of errors made on each set prior to the attainment of criterion. As can be seen in Figure II, S_1 made 60, 31, 24, 4, and 18 errors to the first, second, third, fourth, and fifth set, respectively. S_2 made 82, 39, 74, 0, and 2 errors to the five sets. S_3 was presented only 4 sets, since the remaining letters were labeled correctly during the baseline period. A total of 5, 12, 28 and 53 errors were made to these sets. Except for S_3, a general decrease in errors across sets can be discerned (Figure II).

Pointing to letters in response to verbal cues (Task IV) was taught during trials 7-28. The number of correct increased from 46 and 42 in trials 7 and 8 to 78 in trials 27 and 28 (Figure I-D).

Verbally labeling letters as they occur in words (Task V) was taught during trials 29-45. The number of correct responses increased from 72 and 70 in trials 29 and 30 to 78 in trials 44 and 45 (Figure I-E).

Discussion

The instructional objectives of the program were realized. All three students performed or acquired the defined pre-reading skills. While the results are encouraging a number of procedural limitations and issues related to the development of reading should be acknowledged.

First, the data is correlational, and thus does not allow for differentiating either the effects of the specific procedures used or the effects of concurrent classroom instruction.

Second, the teacher reported her concern that the students were "bored" during some of the teaching procedures. It is often assumed that such boredom results from repeated presentation of the same instructional materials. However, as some repetitiveness seems necessary when instructing trainable students, it might be more efficacious to view boredom as a function of performance consequences rather than as a function of stimulus repetition.

Third, the content of a reading curriculum for trainable students has yet to be defined and empirically verified. Whether the skills taught here would be necessary in such a curriculum is not yet clear.

F ally, the effectiveness of this and other reading programs suggests that trainable students might be capable of acquiring many complex reading skills. The problem now seems to be that of delineating the required skills and developing the instructional ingenuity necessary for teaching them.

FIGURE I

Number of correct responses made by 3 students to instructional materials during: A) Baseline; B) Teaching Task II; C) Teaching Task III (See Figure II); D) Teaching Task IV; and E) Teaching Task V.

FIGURE II

Number of errors made by each of 3 students before attaining criterion performance on sets of three letters during the teaching of Task III.

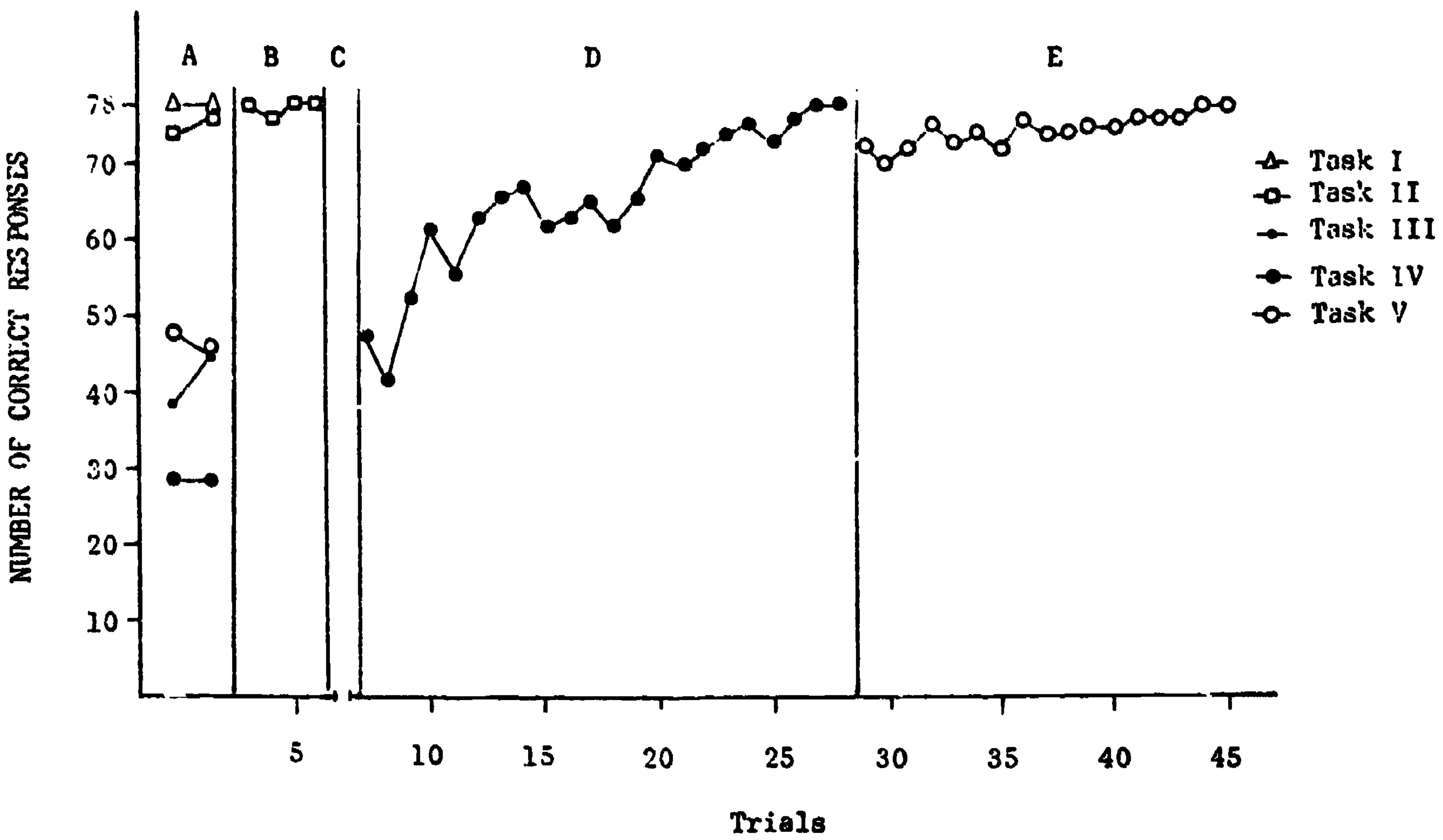


FIGURE I

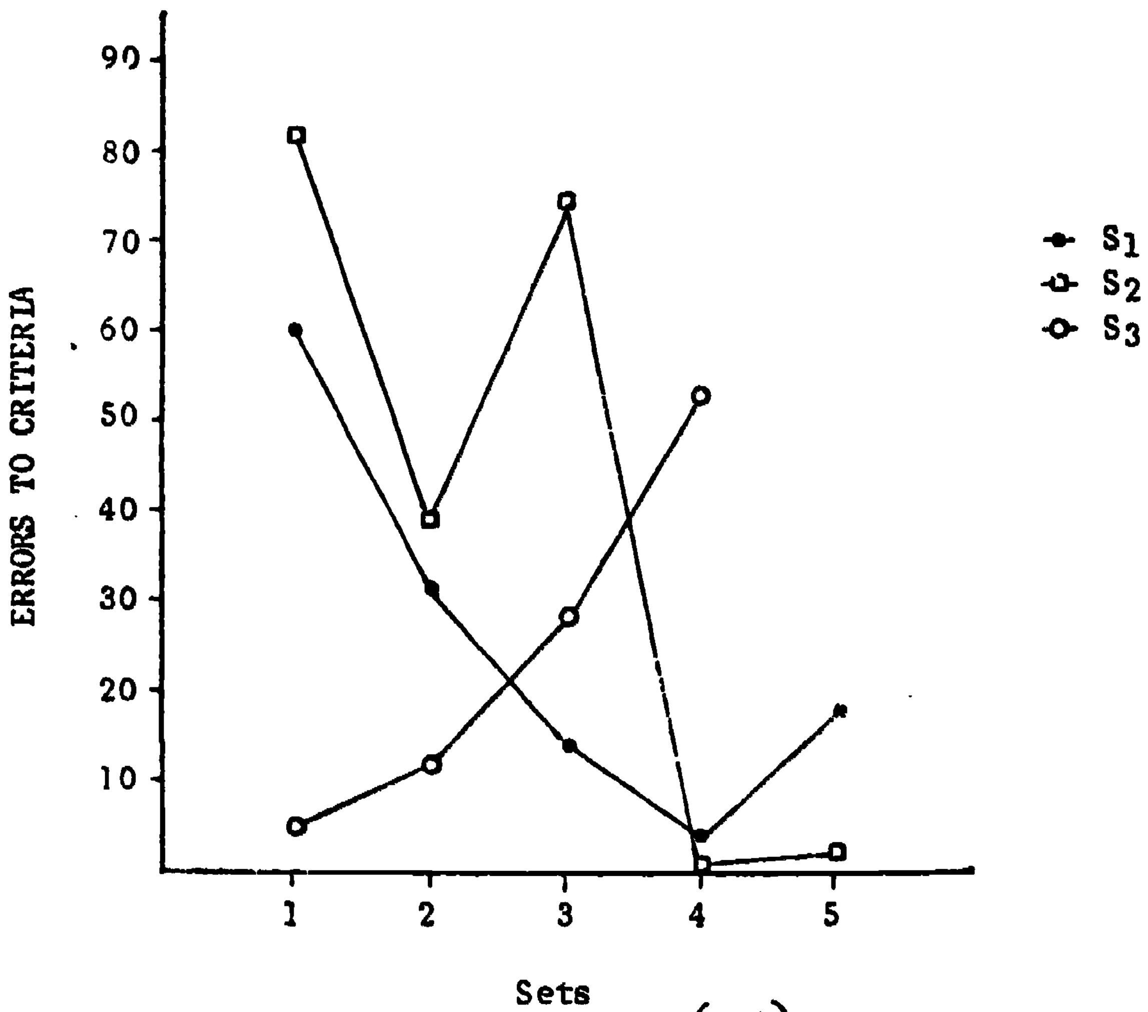


FIGURE II (266)

n — h a n

o — e c o

p — p h o

q — q j e

r — e r o

s — z s t

t — t r v

u — m r u

v — z v c

w — z n w

x — x s v

y — j x Y

z — r w z

References

Brown, L., Fenrick, N., & Klemme, H. Trainable level retarded students teach trainable level retarded students. Teaching Exceptional Children, in press.

Brown, L., Hermanson, J., Klemme, H., Haubrich, P., & Ora, J. Using Behavior Modification Principles to Teach Sight Vocabulary. Teaching Exceptional Children, Spring, 1970.

Brown, L., Jones, S., Troccolo, E., Heiser, C., & Bellamy, T. Teaching Functional Reading to Young Trainable Students: Toward Longitudinal Objectives. Unpublished paper, University of Wisconsin, April, 1971.

Brown, L., & Perlmutter, L. Teaching Functional Reading to Trainable Level Retarded Students. Education and Training of the Mentally Retarded, 1971, 6, 74-84.

Dunn, L. (Ed.) Exceptional children in the schools. New York: Holt, Rinehart and Winston, 1963.

Goldberg, ., & Rooke, M. Research and educational practices with mentally deficient children. In N. G. Haring and R. L. Schiefelbusch (Eds.) Methods in special education. New York: McGraw-Hill, 1967, 112-136.

Spache, G., & Spache, E. Reading in the elementary school. Boston: Allyn and Bacon, Inc., 1969.

Staats, A., & Butterfield, W. Treatment of nonreading in a culturally deprived juvenile delinquent: An application of reinforcement and principles. Child Development, 1965, 36, 925-942.

Arithmetic papers

Simple arithmetic skills are prerequisite to typical community functions such as shopping, money management, time-telling, travel and participation in sports. To date instructional programs have successfully developed appropriate motor responses to teacher's quantitative directions (Brown, Bellamy, and Gadberry, 1971); simple addition skills (Brown, Bellamy, Gadberry and Sontag, 1971; Bellamy and Brown, 1971); and discriminations of the math operations indicated in written problems (Brown, Shores and Gadberry, 1970). Reports of these instructional programs follow:

A Procedure for the Development and Measurement of Rudimentary Quantitative Concepts in Low Functioning Trainable Students[1]

Lou Brown, Tom Bellamy, Eve Gadberry
University of Wisconsin and Madison Public Schools

Our society is gradually shifting from institutional to community programs for the training and management of low functioning trainable students. This shift in orientation is, no doubt, placing additional demands on many of our community organizations, but the demands being placed on the students seem much more stringent. Obviously, the abilities and concepts necessary for functioning in a community setting greatly exceed those required for institutional living.

Theoretically, it is the responsibility of the public schools to provide its students with the skills and concepts necessary for effective functioning in the community. However, public school programs for low functioning trainable students have been remarkable for their lack of success (Dunn, 1963, p. 151-155). The students in these programs are therefore placed in extremely tenuous positions: They are expected to perform in a rather complex social setting; but one of the major agencies responsible for their development, the public schools, has been singularly ineffective in imparting the skills and concepts necessary for survival in such a setting.

It is no longer acceptable for special educators to assume that trainable level students cannot learn to read, count, work, travel, shop, tell time, etc. The students are now in the community. We must find ways to teach them the necessary skills and concepts.

The ability to deal with quantities of stimuli is among the most basic and important concepts necessary for effective community functioning. This paper is a report of how low functioning trainable students were taught rudimentary quantitative concepts.

A concept is defined here as response generalization across a stimulus dimension. That is, if a student is taught to emit a particular response in the presence of a particular stimulus; that stimulus, in effect, gains control over that response (stimulus control). When dimensions of the stimulus are varied and the student continues to respond as he did to the original stimulus, the student has generalized across a stimulus dimension or has formed a concept (Whaley & Malott, 1968).

In this program, students were taught to make differential responses (pointing to various quantities of pencils, marbles, and blocks) to quantitative verbal stimuli (directions by the teacher). They were first taught to respond correctly to directions which involved various quantities of pencils. After the students learned to respond correctly to directions involving quantities of

[1]This demonstration was supported in part by NICHD Grant 5 P01 HD 03352 to the University of Wisconsin Center on Mental Retardation.

pencils, they were tested and taught to respond correctly to directions involving marbles and blocks, respectively. If the students demonstrated substantial increases in the number of correct quantitative responses made to directions concerning marbles and blocks and/or reached criteria in fewer trials, as the verbal directions were varied, evidence for the formation of a quantitative concept could be claimed. That is, the students could then respond to directions involving quantities regardless of the objects to which the quantities referred.

Most students communicate knowledge of quantitative information by use of verbal or printed symbols. Teachers of low functioning trainable students (I.Q. below 40) rarely experience such luxuries. The students in this program had not yet learned to print and were unable to articulate the numbers from one to five in such a way that the sounds could be scored reliably by neutral observers. Therefore, it was necessary to use a mode of communication which required responses that were in the behavioral repertoire of the students, i.e. pointing.

Method

Students (Ss)

The 4 Ss in the program ranged in CA from 18 to 20 ($\bar{X}$=19), in IQ from 31 to 39 ($\bar{X}$=33), and had been enrolled in public school or community programs for trainable level students from 2 to 12 years ($\bar{X}$=8.2). Medical reports included such diagnoses as Downs Syndrome, meningitis and mental retardation associated with unknown prenatal influences. Ss manifested speech difficulties of such degree that verbally reporting the numbers from 1 through 5, while at times were coherent to the teacher, could not be scored reliably by neutral observers.

Materials

The instructional materials devised for the program consisted of a 24" x 36" piece of posterboard to which 15 3" x 6" posterboard cards were attached. From 1 to 5 pencils, marbles or blocks were randomly placed on each of the 15 cards.

A data sheet was constructed that permitted the continuous recording of each S's response to teacher directions. Correct and incorrect responses were recorded to insure that each S responded to the referred object in the directions. Teaching was shared by a teacher (T) and a teacher aide, and was conducted around a circular table at one side of the classroom.

General teaching design

An adaptation of a multiple baseline design was used to assess the effectiveness of the teaching procedure, (Baer, Wolf, & Risley, 1968). Multiple baseline designs are potentially applicable to a wide variety of instructional measurement problems in that they allow for direct quantitative monitoring of an individual student's progress and for empirical evaluation of teaching effectiveness. In this program baseline measures of responses to three sets of directions were obtained. After correct responding to each set of directions was brought to criterion, correct responding to all three sets of directions was measured. Continuous measures of responses to all three sets of directions would have been too costly in available instructional time.

The entire program was divided into the following components: A) each S was given an opportunity to respond to 5 directions concerning the 5 quantities of pencils (pencil directions) marbles (marble directions) and blocks (block directions) respectively; B) each S was taught to respond correctly to the 5 pencil directions; C) repeat of component A; D) each S was taught to respond correctly to the 5 marble directions; E) repeat of component A; F) each S was taught to respond correctly to the 5 block directions; G) repeat of component A; H) repeat of component A after one week.

Teaching and measurement procedures

A baseline, in any teaching situation, is essentially an inventory of current functioning on the task of concern. It provides the teacher with a quantitative record of individual performance at a particular time and serves as a standard by which subsequent performance may be compared. To insure that the baselines in this demonstration did, in fact, inventory S's ability to discriminate the various quantities, it was first established that each S could discriminate between the items themselves. Twelve consecutive correct responses (pointing to the named object) were obtained on a three-choice discrimination task.

Three baselines reflecting Ss ability to respond differentially to each of the three sets of directions were obtained in the following manner:

> T placed the teaching board in front of S_1 and directed, "Point to the card that has just (1, 2, 3, 4 or 5) pencils on it." The response was recorded and the procedure was repeated with S_2, S_3, etc. except that consecutive directions came from different sets and involved different quantities.

A baseline trial was completed when each S had responded to all 15 directions. No indication was given that a response was correct or incorrect during the baseline trials or in any of the subsequent testing trials. Complete control of this contingency was sometimes difficult, however, since Ss did at times correct each other.

The following teaching procedure was employed in each of the 3 teaching components:

A) T placed the teaching board in front of S_1 and directed, "Point to the card that has just __ pencils on it." The response was recorded by T.

B) Correct responses were followed immediately by such statements as "Great, Good, That's right." In addition, T and Ss clapped and cheered when an S made a correct response.

C) If the response was incorrect T said "No, that is not the card with __ pencils on it. This is the card with __ pencils on it (T modeled the correct response). T then said "Point to the card with __ pencils on it." If the correct response was made, it was followed with congratulatory statements and S was asked to count aloud the pencils on the card. If the correct response was not made, the modeling procedure was repeated. (At no time was it necessary to repeat the modeling procedure more than twice for a particular S in a given trial.) T then moved the teaching board in front of S_2, S_3, etc. and repeated the procedure. The same direction was not given twice in succession.

Results

In a given trial each of the 4 Ss could make from 0 to 5 correct responses to one of the 3 sets of 5 directions (pencils, marble, or block directions.) The 4 Ss combined could make from 0 to 20 correct responses to one of the sets of directions. Criterion performance for each teaching phase consisted of 3 consecutive trials in which all Ss responded correctly to all 5 directions. A testing period followed the attainment of the criterion with each set of directions. The entire program required ", ... 20 min. teaching and measurement trials.

In the baseline period (trials 1 through 4) Ss averaged 8, 7 and 8 correct responses to the pencil, marble and block directions, respectively (See Figure 1).

During trials 5 through 43 Ss received instruction designed to teach them to identify the quantities of pencils to which T referred. As can be discerned from Figure 1, Ss gradually acquired the ability to identify the quantity of pencils referred to by T; until at trials 41 through 43, each S correctly responded to the 5 pencil directions.

In trials 44 and 45 each S responded to all 5 pencil, marble and block directions. As can be discerned from Figure 1, Ss maintained perfect responding to pencil directions. In addition, the number of correct responses made to marble and block directions is substantially greater than those recorded in the baseline period. During trials 1 through 4 Ss averaged 8 and 9 correct responses to the marble and block directions respectively. However, during trials 44 and 45 Ss averaged 15 and 16 correct responses to the marble and block directions respectively.

During trials 46 through 54 Ss were taught to correctly respond to the 5 marble directions. Although 39 trials were necessary to teach correct responding to pencil directions, only 9 trials were necessary to teach correct responding to marble directions.

During trials 55 and 56 Ss again responded to all 5 pencil, marble, and block directions. The perfect responding to the pencil and marble directions was maintained in trial 55 but one S incorrectly responded to a marble direction in trial 56. The number of correct responses made to the block directions increased from an average of 9 in trials 1 through 4 to 15 in trials 44 and 45 to 16 in trials 55 and 56.

During trials 57 through 63 Ss were taught to correctly respond to the 5 block directions. Seven trials were necessary to reach criterion on the block directions.

In trials 64 through 70 Ss again responded to the 5 pencil, marble, and block directions. While the number of correct responses ranged from 18 to 20, in trials 68 through 70 Ss performed perfectly.

After the 1 week retention period, one S made an incorrect response to a marble card on trial 71 but perfect responding was regained in trial 72.

Discussion

There were two indications that the students generalized across stimulus dimensions i.e., developed quantitative concepts. First, during the baseline period correct responding to the three sets of directions was minimal. However, after the students had been taught to correctly respond to the five pencil directions, substantial increases in correct responding to the marble and block directions were observed. Second, as the objects referred to in the directions were changed, fewer teaching trials were needed to reach criteria. That is, while 39 teaching trials were required to reach criterion on the pencil directions, only 9 and 7 training trials were required to reach criteria on the marble and block directions respectively (See Figure 2).

The results of this demonstration obviously do not indicate that the problem of teaching quantitative concepts to low functioning trainable students has been solved, that these students now have all the quantitative concepts necessary to function effectively in their school and community environments, or that the procedures used here should be expected to work as effectively with all trainable students. The results obtained here do suggest, however, that it is possible to teach basic quantitative concepts to trainable students. In fact, it was possible in this demonstration to teach quantitative concepts to students who had failed to acquire these concepts after as many as twelve previous years in public school programs.

It is theoretically possible that lower level trainable students may never be capable of acquiring a behavioral repertoire that will allow them to function even quasi-independently in their communities. On the other hand, these students may be capable of acquiring such a repertoire, but the professionals responsible for their training may not, at this time, have an instructional technology that is sufficiently developed to teach them.

In spite of the historical difficulties encountered in attempts to teach trainable students relatively complex tasks, the results here as well as those recently obtained by others concerned with similar problems are encouraging

(Gold, 1968; Brown & Perlmutter, 1971). These authors have successfully combined direct measurement procedures with the systematic application of empirically established learning principles such as graduated modeling, contingent reinforcement and fading to practical instructional problems.

Hopefully, the continued systematic application of these as well as other learning principles to different and more complex behaviors will result in a body of instructional techniques that will have a significant effect on the longitudinal development of trainable students.

References

Baer, D., Wolf, M. M. and Risley, T. Some current dimensions of applied behavior analysis, Journal of Applied Behavior Analysis, 1, 1968, p. 91-97.

Brown, L. and Perlmutter, L. Teaching functional reading to trainable students, Education and Training of the Mentally Retarded, 1971 (In Press).

Dunn, L. M. Exceptional Children in the Schools. Holt, Rinehart and Winston, 1963, p. 151-155.

Gold, M. W. Acquisition of a Complex Assembly Task by Retarded Adolescents, Final Report Project #8-8060, U.S. Office of Education, May, 1969.

Whaley, D. and Malott, R. Elementary Principles of Behavior. Behaviordelia, Kalamazoo, Michigan, 196_.

List of Figures

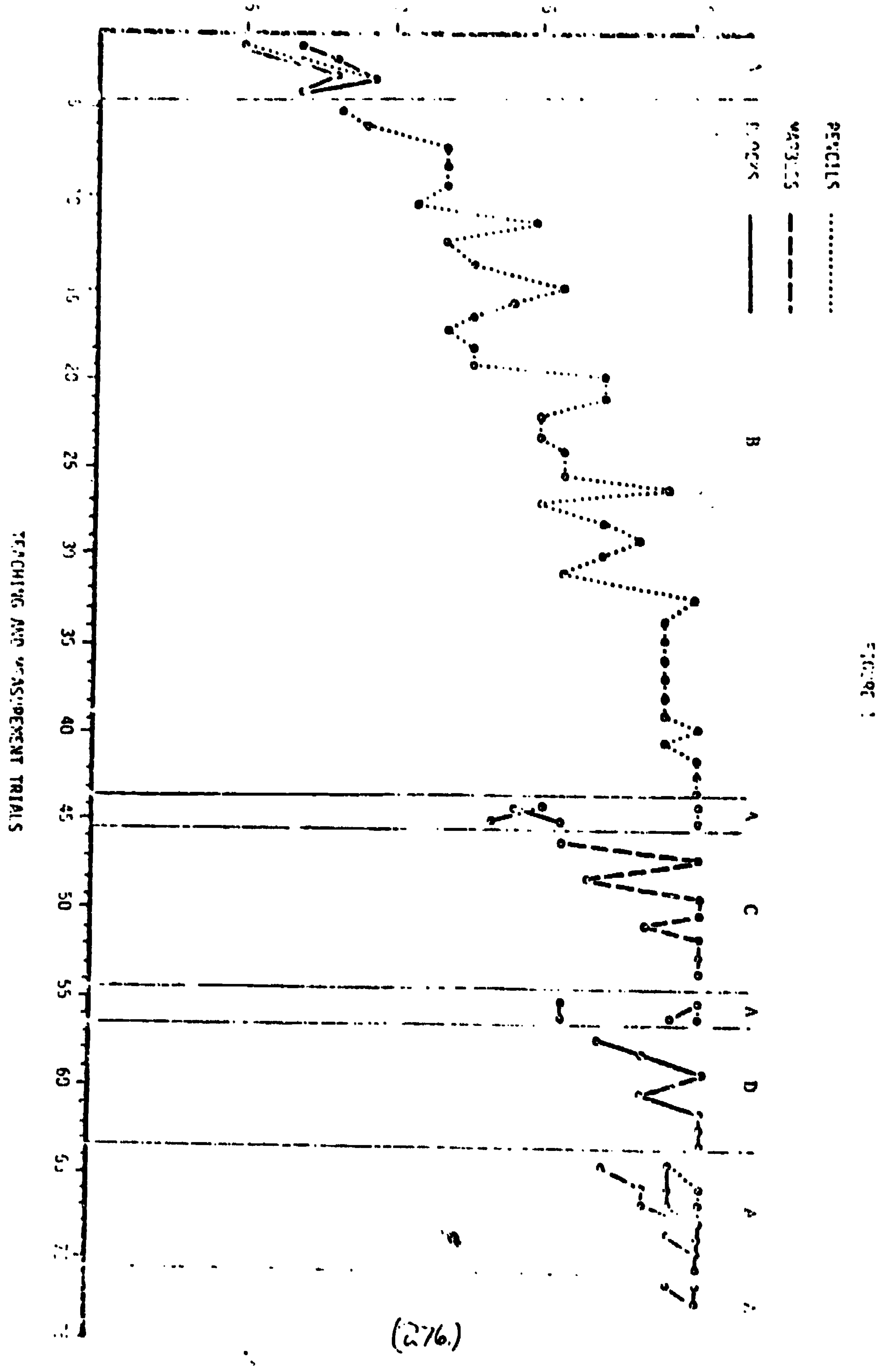
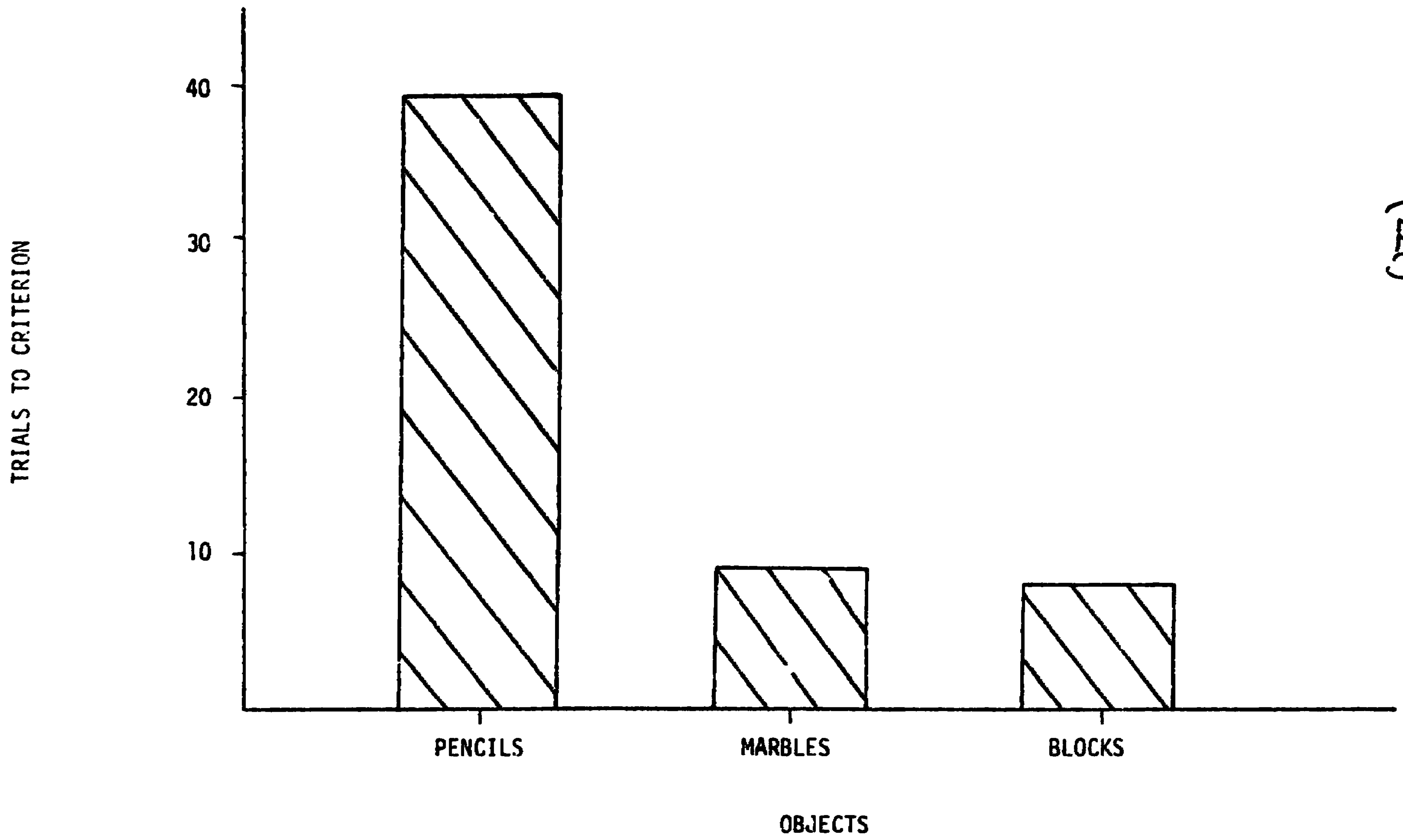


FIGURE 1
PENCILS
MARBLES
BLOCKS
A
B
A
C
A
D
A
25
30
35
40
45
50
55
60
TEACHING AND MEASUREMENT TRIALS

(276)

FIGURE 2



TRIALS TO CRITERION
40
30
20
10
PENCILS
MARBLES
BLOCKS
OBJECTS

Teaching Addition to Young Trainable Students:
A Sequential Procedure (1)

Lou Brown, Tom Bellamy, Eve Gadberry and Edward Sontag (2)

This paper describes how principles of task analysis and applied behavior analysis were used successfully to teach simple addition to four trainable level retarded students.

Task analysis as used here refers to the clear delineation of all behaviors involved in a criterion response and the identification of other behaviors that appear to be logical prerequisites of the criterion response. The criterion response in this teaching program was defined as writing the correct answer to addition problems involving two numbers totaling ten or less. It was postulated that the following behaviors (component tasks) were prerequisites to successful performance of the criterion response:

I) Rote Counting to 10
II) Counting three dimensional objects
III) Counting two dimensional objects
IV) Number Identification
V) Writing numbers
VI) Pairing numbers with quantities of dots
VII) Drawing quantities of lines

These seven component tasks were taught in sequence. The teaching of each component involved prescribed environmental manipulations based on the the following empirically established principles of applied behavior analysis:

A) Imitation
B) Contingent positive reinforcement
C) Discriminative stimulus control
D) Fading

The entire teaching program consisted of three general phases. In the first phase responses to the addition problems and to the seven prerequisite components were measured under baseline conditions. In the second phase the seven components were taught in sequence, and performance on each component was measured. In the third phase correct responses to the addition problems were measured and taught.

---

[1]This paper was presented at the 1971 State Convention of the Wisconsin Association of Retarded Children, Rhinelander, Wisconsin.

[2]The investigation was supported in part by funds from the Wisconsin Alumni Research Foundation and in part by NICHD Grant 5 P01 HD 03352-02 to the University of Wisconsin Center on Mental Retardation.

Method

Students (Ss)

The 4 Ss ranged in age from 9.0 to 11.2 ($\bar{X}$=10.5) in IQ from 32 to 45 ($\bar{X}$=38.75) and had been enrolled in public school programs for trainable students from 3 to 5 years ($\bar{X}$=4.25).

Three Ss had been previously diagnosed as manifesting Down's Syndrome and records of the remaining S noted diagnoses of "bilateral aniridia", childhood psychosis and "delayed language," and contained comments such as "cannot attend well in a group," "daydreams," "babbles to herself," "easily distracted," and "displays temper."

The entire program was conducted as a part of a regularly scheduled public school class activity. While the remaining 5 students in the class were engaged in similar instruction, the 4 S's were seated around a table in one corner of the classroom with a teacher (T).

Materials

When each component was being taught, Ss were required to make discrete responses to verbal directions and/or instructional materials. The following materials were constructed from items readily available in most classroom situations.

The three-dimensional objects which were counted during Component II were 10 blue wooden blocks, 1" x 1" x 1".

During Component III, S's counted 1" x 2" strips of blue masking tape, attached in quantities from 1 to 10 on 10 sheets of 8½" x 11" posterboard.

During Components IV, VI and VII, 10 3" x 5" index cards on which all numerals from 1 to 10 were printed, were used as instructional materials.

Ten 3" x 5" index cards, on which were drawn all quantities of dots from 1 to 10, were used during Component VI. These cards were randomly attached to 2 strips of posterboard, 29" x 3".

The addition problems used during this demonstration consisted of all combinations of two numerals which totaled 10 or less. These 25 problems were printed horizontally on 5 8½" x 5½" sheets of white paper, with 5 problems per sheet. During the teaching phase, a sixth (demonstration) problem was added to the top of each sheet.

Individual histograms were constructed in ½" x 11" paper and used during the final phase (teaching addition). These charts were updated after each trial and provided an immediate indication of the comparative frequency of correct addition responses.

Mimeographed data sheets were used during the measurement and teaching of the component tasks. During each trial, every S made 10 discrete responses, each of which related to a specific numeral or quantity from 1-10. Thus, a complete record of correct and incorrect responses was maintained on a data sheet with ten columns representing these numerals and a row for each S. One sheet was used for each trial.

The frequency of correct group responses was plotted after each trial on a polygon.

Teaching the Component Tasks

The simultaneous presentation of baseline and teaching procedures reflects the authors' belief that baseline assessment is an essential part of any teaching procedure, not an imposed experimental manipulation. Thus, baseline measures of performance on all tasks were taken at the beginning of the program, prior to the onset of any of the teaching procedures.

Rote Counting (Component I). Baseline measures of rote counting were taken in the following manner:

> T asked each S in turn to "Count to 10." Each numeral voiced in sequence by an S prior to his first error was recorded by T as correct. No feedback was given concerning the correctness of any response.

Identical instructions were given during the teaching of rote counting. Each correct counting response was immediately complimented by T, who remarked "Good," "Thats right," "Great," etc. Other S's were constantly encouraged to applaud or compliment correct responses. Had an error occurred, T would have modeled the correct response and then repeated her initial instruction.

Counting three-dimensional objects (Component II). Baseline measures of S's performance on this task were taken in the following manner:

> T placed 10 wooden blocks in front of each S in turn and instructed him to "Count these blocks." A correct response was recorded for each numeral which was voiced in sequence at the same time that S moved one block. Failure to execute either the motor or verbal part of the task resulted in T scoring an error in the column corresponding to that numeral and in all remaining columns. T said "Thank you" after each S completed the task, regardless of the correctness of his performance.

T gave identical instructions during teaching. As in Component I, T made complimenting remarks immediately after each correct response, and encouraged other S's to do the same. When an incorrect response occurred, T recorded the performance and then instructed S to "Start over, and move one block for each number you say." Verbal instructions of this nature were sufficient in every case to produce the correct response.

Counting two-dimensional objects (Component III). Baseline measures of performance on this task were taken in the following manner:

> T placed one of the 10 cards (on which all quantities from 1 to 10 dots were displayed) in front of an S and instructed him to "Count the dots on this card." S's response was recorded as correct if appropriate numerals were voiced in sequence as S touched each dot on the card. T said "Thank you" regardless of the correctness of the response, and then presented a card with a different quantity of dots to the next S. The procedure was continued until each S had responded to all 10 cards.

The same procedures were followed in teaching, except that compliments immediately followed each correct response. When an incorrect response occurred, T recorded the error and then instructed S to "Start over, and touch one dot for each number you say." If the correct response occurred, T made complimentary remarks but added "You should have done that the first time." On the two occasions when these instructions did not result in the correct response, T physically guided S through the motor movements (pointing to each dot) while S voiced the appropriate numerals. The initial instruction was then repeated. This procedure consistently occasioned the correct response.

Number identification (Component IV). Baseline measures of performance on this task were taken in the following manner.

> T placed 1 of the 10 index cards (on which all numerals from 1 to 10 were printed) in front of an S and asked "What number is this?" The response was recorded and T said "Thank you" whether or not the response was correct. A different numeral was then presented to the next S, so that neither the same nor consecutive numerals were used in two consecutive presentations. The procedure was continued until each student had responded to all 10 numeral cards.

The same procedures were followed during teaching except that compliments were given immediately after each correct response. When an incorrect response occurred, T said, "No, this number is a (3). What is this number?" The correct response consistently followed this modeling procedure and was complimented by such remarks as "That's good. Try to get it on the first try from now on."

Writing numbers (Component V). Baseline measures of this task were taken in the following manner:

T instructed S to "Write number (4)." The response was recorded with no indication of correctness, and the next S was asked to write a different numeral. The procedure was continued until each S had responded to a direction to write all 10 numerals.

The same procedures used in teaching were followed except that, compliments from T and the other Ss immediately followed each correct response. When an incorrect response was recorded, T first said "No, that is not a (4). Try again." If the correct response was still not emitted, T modeled the response, i.e., wrote "4" on a sheet of paper, the numeral was shown to S, and then removed from view, after which the initial instruction ("Write number 4.") was repeated. This procedure consistently resulted in the correct response.

Pairing numerals with quantities of dots (Component VI). Baseline measures of this task were taken in the following manner:

Two strips of posterboard, to which 10 index cards with all quantities of dots from 1 to 10 were attached, were placed in front of an S. T then showed S an index card on which a numeral was printed and asked him to "Count the dots on each card until you find the one that has this many dots on it." S's response was recorded, and the remaining 9 numerals were presented in random order with the same instruction. The procedure was repeated with each S.

The same procedures were used during teaching except that compliments followed each correct response. When an incorrect response was recorded, T asked S to count the dots on the card he had indicated. When S reported the total, T asked if the total corresponded to the numeral presented. The initial instruction was then repeated: "Count the dots on each card until you find the one that has this many dots on it." This procedure was, on some occasions, repeated more than once. When the correct response occurred, S was complimented and asked to "see if you can find it on the first try from now on."

Drawing Quantities of lines (Component VII). Baseline measures on this task were taken in the following manner:

T placed an index card, on which a numeral was printed, in front of S and asked him to "Draw this many lines." The response was recorded, and a different numeral was presented to the next S. The procedure continued until each S had responded to all 10 cards.

The same procedures were used during teaching, except that compliments immediately followed each correct response. When an incorrect response was recorded, T first asked S to count the lines he had drawn, and then repeated her initial instruction: "Draw this many lines." This was repeated until the correct response occurred (never more than three times), and compliments, together with a request to do it the first time from now on, followed the correct response.

Teaching Addition. Baseline measures of addition performance were taken in the following manner:

> T gave S one of the 5 sheets of addition problems and instructed him to, "Work these problems." As soon as S finished this sheet, another was given without feedback, until each S had completed all 5 problem sheets.

The same procedures were used to teach addition with two exceptions. First, the consequences of each response were determined by the accuracy of that response. Second, a sixth problem (demonstration problem) was added to the top of each sheet. T provided verbal instructions as needed by Ss to perform the demonstration problem prior to his beginning work on each sheet.

At the beginning of the first teaching trial, T demonstrated the behaviors involved in completing an addition problem by drawing the correct number of lines under both numbers, counting the lines aloud and writing the total. Each S was then individually given a problem sheet, and the following verbal directions, together with modeling, priming, and praise were used to insure correct responding to the demonstration problem:

(1) What number is this (pointing to the first numeral)?
(2) Draw that many lines under the number.
(3) What number is this (pointing to the second numeral)?
(4) Draw that many lines.
(5) Count all the lines.
(6) How many are there?
(7) Write that number here (pointing to space provided for the answer to the addition problem).

As soon as each S responded correctly to these directions T systematically faded them until Ss were instructed only to "Work this problem."

After S completed the demonstration problem on each sheet he individually completed the remaining 5 problems without assistance, directions, or feedback from T. When S completed a problem sheet, he brought it to T, who graded it (placing large red checks by correct problems) in Ss presence, and who provided praise and compliments for problems answered correctly. In addition, a histogram, showing the number of correct responses across trials, was posted on the classroom wall and was maintained by T on a daily basis.

Results

During any testing or teaching trial each S could make from 0 to 10 correct responses to the component tasks and from 0 to 25 correct responses to the 25 addition problems. Thus, the four Ss could make a total of 40 correct responses to the 7 component tasks or a total of 100 correct addition responses during each trial. Criterion performance for each component task was defined as two consecutive trials in which 40 correct responses were made. Criterion performance for addition was defined as three consecutive trials in which 100 correct responses were made.

During the baseline period (Trials 1 and 2, Figure I-A and Figure II-A) Ss averaged: 40, 38.5, 39.5, 39, 36, 28, and 17.5 correct responses to components I through VII respectively and 0.5 correct responses to the 25 addition problems.

During trials 3 and 4 (Figure I-B) Ss attained criterion performance on rote counting (Component I).

Counting three dimensional objects (Component II) was taught during trials 5 through 13. As can be discerned from Figure I-C, performance was close to criterion but nevertheless variable until trials 12 and 13.

Counting two dimensional objects (Component III) was taught during trials 14 through 20. As can be discerned from Figure I-D, performance was close to criterion but nevertheless variable until trials 19 and 20.

Number identification (Component IV) was taught during trials 21 through 27. As can be discerned from Figure I-E, performance was close to criterion but nevertheless variable until trials 26 and 27.

Writing numbers (Component V) was taught during trials 28 through 34. As can be discerned from Figure I-F, performance was close to criterion but nevertheless variable until trials 33 and 34.

Pairing numerals with quantities of dots (Component VI) was taught during trials 35 through 38. The number of correct responses increased from 31 in trial 35 to 40 in trials 37 and 38 (Figure I-G).

Drawing quantities of lines (Component VII) was taught during trials 39 through 47. The number of correct responses increased from 36 in trial 39 to 40 in trials 46 and 47 (Figure I-H).

Addition was taught during trials 48 to 89. The number of correct addition responses gradually increased from 5 and 4 in trials 48 and 49 to 100 in trials 87, 88 and 89 (Figure I-I).

Discussion

A sequential procedure utilizing principles of task analysis and applied behavior analysis was used to teach four trainable level retarded students to add any two numbers totaling ten or less.

While the success of the program was obvious, the measurement design does not allow for the delineation of the specific factors responsible for the success. In addition, the rather gradual acquisition of correct addition responses (tasks 48-89) strongly suggests that the procedures utilized might be improved. Because of these two apparent weaknesses programmatic replications which includes more precise measurement and a more detailed task analysis seems mandatory. Such a replication has been designed and is in progress.(1)

(1)The replication referred to above has been completed and is reported as: A Sequential Procedure for Teaching Addition Skills to Trainable Retarded Students, Bella..y, T. and Brown, L., 1971.

Figure I

Number of correct responses to instructional materials during A) Baseline; B) Component I; C) Component II; D) Component III; E) Component IV; F) Component V; G) Component VI; and H) Component VII.

Figure II

Number of correct responses to addition problems during A) Baseline and I) Teaching addition.

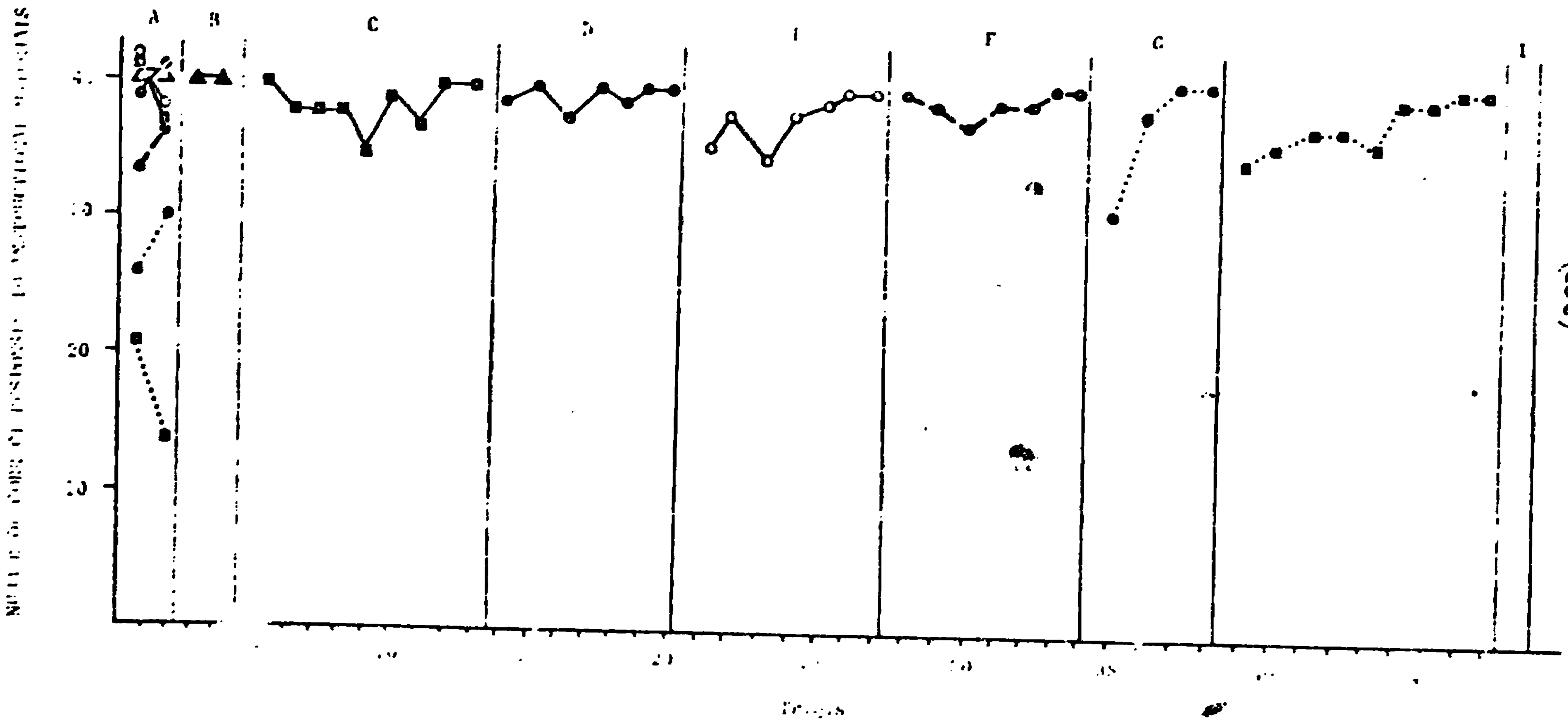


FIGURE 1

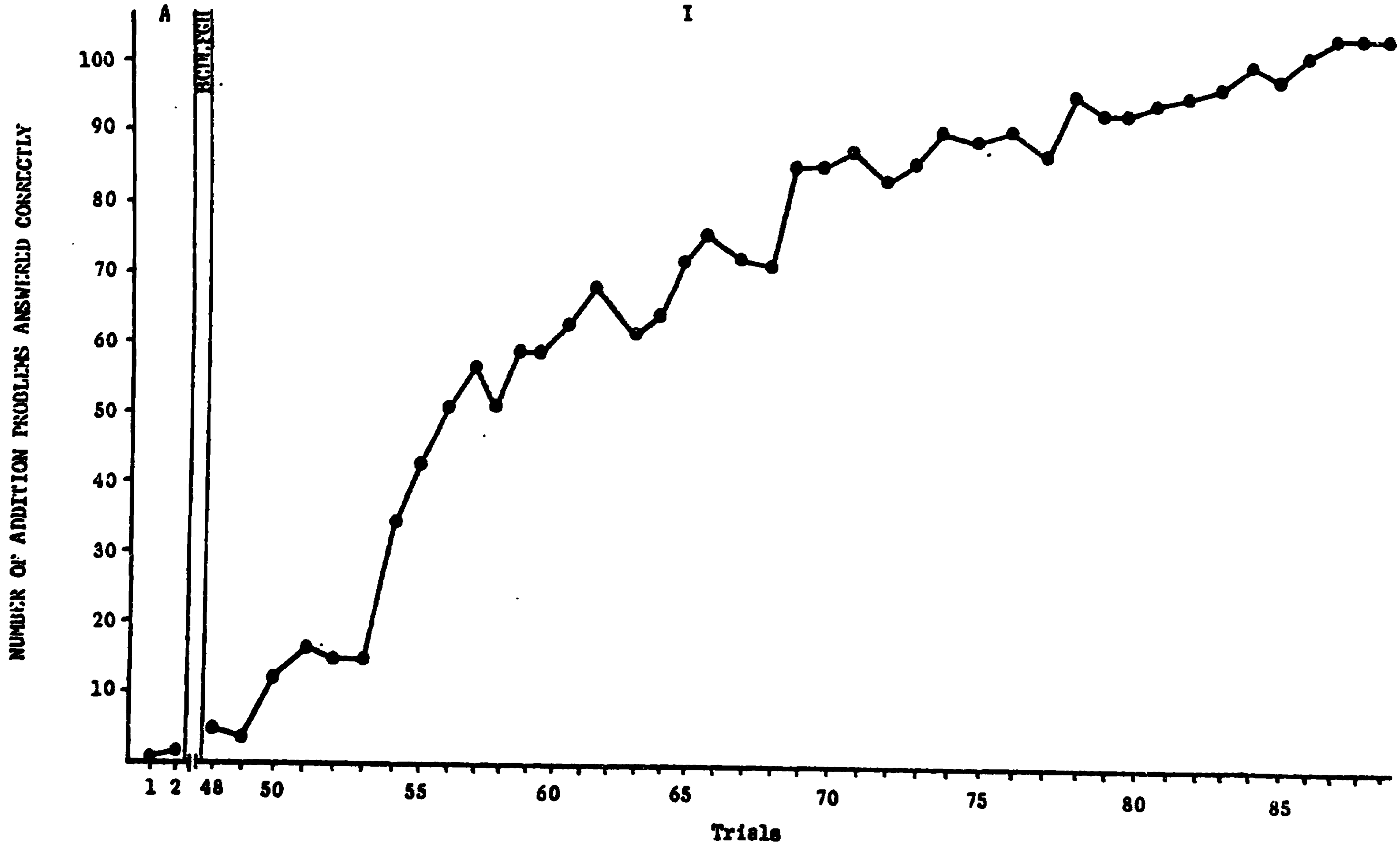

NUMBER OF ADDITION PROBLEMS ANSWERED CORRECTLY
A
BCDEFGH
I
100
90
80
70
60
50
40
30
20
10
1 2 48 50 55 60 65 70 75 80 85
Trials

FIGURE II

A SEQUENTIAL PROCEDURE FOR TEACHING ADDITION SKILLS TO TRAINABLE RETARDED STUDENTS

Tom Bellamy and Lou Brown

University of Wisconsin and Madison Public Schools[1]

Several acknowledged educational leaders have assumed that trainable students are incapable of acquiring functional academic skills (Kirk, 1957; Dunn, 1963; Goldberg & Rooke, 1967). In fact, the development of self-care skills and social behaviors has been emphasized to the exclusion of academic content in trainable classes (Goldberg & Rooke, 1967). Investigations of the effects of existing school programs support this position. Studies reviewed by Dunn (1963), Kirk (1964) and McCarthy and Scheerenberger (1966) failed to establish that public school placement for trainable students facilitates either academic achievement or social adjustment.

The experimental analysis of behavior (Skinner, 1953, 1969) provides an empirical and conceptual framework for a more optimistic approach to the education of trainable students. By focusing on principles relating a student's actions to events in his environment (Holland & Skinner, 1961), this conceptual framework implies that inferring the capabilities of trainable students from progress in existing programs may be less productive than developing teaching programs in which these students do, in fact, learn (Lindsley, 1964; Bijou, 1968, Gardner, 1971).

Techniques associated with the analysis of behavior (Skinner, 1968; Baer, Wolf & Risley, 1968) only are beginning to be applied to teach complex behaviors to trainable students, but available demonstrational evidence is highly encouraging. Instructional techniques based on experimentally established learning principles have been used successfully with trainable students to develop a variety of behaviors associated with vocational and academic achievement (Birnbrauer & Lawler, 1964; Huddle, 1967; Crosson, 1969; Lent & Childress, 1970; Brown, Hermanson, Klemme, Haubrich & Ora, 1970; Brown & Perlmutter, 1971; Screven, Straka & LaFond, 1971).

Reports by Coleman (1970) and Brown, Bellamy and Gadberry (1971) are of particular relevance to the demonstration described here. In the Coleman study reinforcement procedures were used to increase the counting abilities of a single trainable student. The student, who could rote count to 15 at the outset of the program, gradually acquired the ability to assign numerals to fifteen objects, so that finally he could hand the experimenter the numer of objects requested. A similar skill was taught by Brown, Bellamy and Gadberry,

---

[1]This demonstration was supported in part by funds from the Wisconsin Alumni Research Foundation and in part by NICHD Grant 5 P01 HD 03352-02 to the University of Wisconsin Center on Mental Retardation. Appreciation is expressed to Dr. Ed Sontag, Director of Special Education, Madison Public Schools, for his administrative support.

who used a group instruction procedure involving modeling and positive reinforcement in a classroom setting to teach trainable students to indicate correctly various quantities of different objects.

Presented here is a group instruction procedure which extends the teaching methods involved in the above studies to the classroom development of more complex behaviors associated with longitudinal academic objectives. Basic to this procedure are: the definition of behavioral objectives; the specification of entering behaviors; the construction of a sequence of intermediate behaviors; the systematic manipulation of the environment; and the application of measurement and evaluation procedures (Gardner, 1971; Haring, 1968).

The definition of behavioral objectives. As a result of this program, four trainable students were expected to write the correct answer to two-number addition problems totalling ten or less, without prompts, cues or verbal instructions from the teacher.

The specification of entering behaviors. Quantitative measures of responses to a variety of instructional materials, obtained prior to the outset of instruction (baseline assessment) served as an inventory of the students' entering behaviors.

The construction of a sequence of intermediate behaviors. The discrepancy between empirical measures of existing behaviors and the specified behavioral objectives was bridged by a sequence of instructional tasks, identitied through an analysis of the prerequisite and component behaviors involved in the terminal performance. The instructional program was composed of the following sequence of tasks: Labeling printed numerals (Task I); Writing numerals from verbal cues (Task II); Counting quantities of lines and reporting the total verbally (Task III); Drawing quantities of lines corresponding to printed numerals (Task IV); Counting quantities of lines and writing the total (Task V); Two pre-addition exercises (Tasks VI and VII); and Addition (Task VIII).

The systematic manipulation of the environment. Teaching each task involved the employment of prescribed environmental manipulations contingent on the accuracy of a student's response to defined instructional materials. These manipulations were based on experimentally established principles relating behavior occurence to contingent positive reinforcement, modeling, chaining, and the establishment of discriminative stimulus control (Whaley & Malott, 1968; Bandura, 1969).

The application of measurement and evaluation procedures. During each teaching trial the number of correct responses to the task under instruction was measured and recorded. Some evidence of the effectiveness of the teaching procedures was provided by the attainment of predefined performance criteria on successive tasks.

METHOD

Students and Setting

The four students (Ss) ranged in age from 13-0 to 20-4 ($\bar{X}$=17-6), in IQ (Stanford-Binet) from 35 to 40 ($\bar{X}$=38.3) and had been enrolled in public school and community special education classes from 2 to 11 years ($\bar{X}$=5.5). All 4 are currently enrolled in a departmentalized public school program for trainable students and are assigned to the lowest-functioning class.

Reports of recent medical and psychological examinations indicate diagnoses of "meningo-encephalitis," "trainable mental retardation," "severe learning disability," "psychotic," "reactive emotional disturbance," "psychotic with a symbiotic type of disorder," and "minimal brain injury with possible psychiatric complications." In addition, a recent opthamologist's report indicated that one S had "corrected visual acuity estimated at 20/200 for each eye."

Reports from teachers and psychologists during the last two school years contained such comments as: "has difficulty discriminating letters;" "seldom coordinates eye-hand activities;" "cannot print numbers from one thru ten;" "his visual handicap holds him back from progress in many areas;" "seldom recognizes likenesses and differences in shapes, size, and color;" "eye-hand coordination and visual perception appear to be very poor;" "seldom speaks in sentences;" "seldom interacts willingly with teacher and other children in the classroom;" "frustrations are matters that he cannot cope with;" "has difficulty sitting still;" "seldom cooperative in work;" "never approaches others for co-operative play;" "seems unaware of others;" "shows no enjoyment or displeasure;" "has no self-confidence;" "extreme negativism;" and "spends 90 percent of his time while in school in stereotyped activities."

The entire teaching program was conducted as a regularly scheduled public school activity. The teacher (T) and 4 Ss were seated around a table on one side of the classroom while a similar group of students was engaged in other number activities with a teacher aide.

Materials

Materials used, in addition to paper and pencils, included: ten 3" X 5" index cards (Numeral Cards), on which all numerals from 1 to 10 were printed (Task I); ten index cards (Quantity Cards) on which 1" lines were drawn in all quantities from 1 to 10 (Task III); mimeographed slips of 2" X 4" paper (Numeral Slips) on each of which a number from 1 to 10 appeared in the top center (Task IV); mimeographed slips of 2" X 4" paper (Quantity Slips) on each of which was printed a quantity of vertical lines from 1 to 10, at the right of which was one horizontal line on which Ss were to write the total number of lines (Task V); mimeographed slips of 2" X 8" paper on which appeared horizontally printed addition problems, including all combinations (25) of two numerals totalling ten or less, with correct quantities of lines drawn under both numerals (Task VI); mimeographed slips of 2" X 8" paper, on each of which appeared an addition problem as in Task VI, except that lines were drawn under only the first numeral in each problem (Task VII): mimeographed slips of 2" X 8" paper on which the 25 arithmetic problems were printed without lines (Task VIII). Addition problems used in Tasks VI, VII and VIII were randomly divided into sets of 10, so that all 25 problems appeared in the first three sets and in each three consecutive sets thereafter. The instructional materials used in the program are illustrated below. (Insert picture of materials about here.)

Edibles, including a variety of cereals and candies, were used in the teaching procedures. Mimeographed data sheets were used during both the measurement and the teaching of Tasks I through V. During every trial each S made 10 discrete responses, each of which related to a specific numeral or quantity from 1 to 10. Thus a complete record of correct and incorrect responses in each trial was maintained on a data sheet with 10 columns and 4 rows. A frequency polygon showing correct responses across trials was maintained by T on a daily basis.

Teaching Procedure

Baseline. At the outset of the program, baseline measures of performance were taken on Tasks I through V and on Addition (Task VIII). Since the presentation of the initial instructional material for each task was constant under baseline and teaching conditions, the procedures followed in obtaining baseline measures are presented along with the teaching procedures. During the baseline period all Ss responded perfectly to tasks requiring labeling numerals from 1-10 in sequence (i.e., counting on a number line) and rote counting. No teaching procedures were employed for these tasks.

Labeling printed numerals (Task I). The following procedures were used to obtain baseline measures:

> T placed 1 of the 10 Numeral Cards in front of S and asked, 'What numeral is this?" The response was recorded without indicating to S whether the response was correct. A different numeral was then presented to the next S, so that neither the same nor consecutive numerals were used in 2 consecutive presentations. The procedure was continued until each S had responded to all 10 Numeral Cards.

The procedures used to measure baseline performance were also used to teach this task, except that the consequences of each response were determined by the accuracy of that response. Immediately after a numeral was labeled correctly, T made complimentary remarks such as, "Good job," 'That's right," "Great," etc., and encouraged other Ss to praise or applaud the correct response. In addition, an edible was given to S. When an incorrect response occurred, T recorded the error and modeled the correct response, 'This is a (3)." The initial instruction was presented again: 'What is this numeral?" One repetition of the modeling procedure was sufficient to produce the correct response on the few occasions that T's first model did not suffice. Praise and applause were given when the correct response occurred, but edibles were provided only when S responded correctly to the initial presentation of the Numeral Card.

Writing numerals from verbal cues (Task II). The following procedures were used to obtain baseline measures:

> T instructed S to, "Write the numeral (4)." Recognizable numerals were recorded as correct, but feedback was not provided. The next S was then asked to write a different numeral, and the procedure was continued until each S had responded to directions to write all 10 numerals.

The procedures used to measure baseline performance were also used to teach this task, except that the consequences of each response were determined by the accuracy of that response. Correct responses were followed with edibles, praise and applause from T and the other Ss. When an incorrect response was recorded, T first said, "No, that is not a (4). Try again." If the correct response was still not emitted, T modeled the response, i.e., wrote "4" on a sheet of paper so that S could observe both T's writing and the written numeral, and then repeated the initial direction: "Write the numeral (4)". On the occasions that the desired response still was not emitted, T repeated the instruction and then guided S's hand as necessary for him to write the numeral. As soon as the correct response occurred, S was praised and applauded, but edibles were not given.

Counting quantities of lines and reporting the total verbally (Task III). The following procedures were used to obtain baseline measures:

> T placed 1 of the 10 Quantity Cards in front of S and said, "Count these lines and tell me how many there are." A correct response was recorded when S pointed to one line for each numeral voiced in sequence, and when he either repeated the last numeral (the correct quantity) or responded correctly when T repeated his question, "How many are there?" S was given no indication of the accuracy of his response. The next S was then given a different Quantity Card, and the procedure was continued until each S had responded to all 10 Quantity Cards.

The procedures used to measure baseline performance were also used to teach this task, with two exceptions. First, the consequences of each response were determined by the accuracy of that response. Second, T faded (i.e., gradually removed) his verbal instruction during the first teaching trial, so that Ss responded in subsequent trials to the presentation of the Quantity Cards without verbal cues or instructions. Correct responses were followed immediately by edibles, praise and applause. When an incorrect response occurred, T first instructed S to, "Try again. Count these lines and tell me how many there are." If the ensuing response was incorrect, T modeled the desired behaviors and then repeated his instruction. If the correct response still did not occur, T physically guided S's hand as S pointed to each line in turn and voiced the appropriate numeral. Praise and applause followed the correct response, but edibles were given only when S responded correctly to the initial presentation of the Quantity Card.

Drawing quantities of lines corresponding to printed numerals (Task IV). The following procedures were used to obtain baseline measures:

> T placed a mimeographed Numeral Slip in front of S and said, "Draw the right number of lines under the numeral." No indication was given S whether his response was correct, and another Numeral Slip, on which a different numeral appeared, was given to the next S. The procedure was continued until each S had responded to 10 Numeral Slips on which all numerals from 1 through 10 appeared.

The procedures used to measure baseline performance were also used to teach this task, with two exceptions. First, the consequences of each response were determined by the accuracy of that response. Second, T faded his verbal instructions during the first teaching trial, so that in subsequent trials Ss responded to the Numeral Slips without verbal cues or instructions. Edibles. praise and applause followed immediately when S drew the correct number of lines. When an incorrect response occurred, T said, "No, that is not the right number of lines. How many lines were you supposed to draw?" When S correctly labeled the numeral on the slip, T gave S a duplicate slip and asked him to, "Try again. Draw the right number of lines under the numeral." If the correct response did not occur, T then modeled the response, (i.e., drew the appropriate number of lines), gave S another duplicate slip, and repeated his instruction. If the correct response still did not occur, S was physically guided as necessary to perform the required behaviors. S received praise and applause when he emitted the correct response.

Counting quantities of lines and writing the total (Task V). The following procedures were used to obtain baseline measures:

> T placed a Quantity Slip in front of S and said, "Count these lines (pointing to the vertical lines) and write the total here (pointing to the horizontal line)." T recorded a response as correct if S wrote the correct numeral. Without indicating whether the response was correct, T gave a different Quantity Slip to the next S, and repeated his instruction. T continued in this manner until each S had responded to 10 Quantity Slips on which all quantities of lines from 1 through 10 appeared.

The procedures used to measure baseline performance were also used to teach this task, except that the consequences of each response were determined by the accuracy of that response. In addition, T faded his verbal instruction during the first teaching trial, so that Ss responded in subsequent trials to the Quantity Slips without verbal cues or instructions. Praise, edibles and applause followed immediately when S wrote the correct numeral in the space provided. When an incorrect response occurred S was given a duplicate Quantity Slip and asked to, "Try again. Count these lines (pointing to the vertical lines) and write the total here (pointing to the horizontal line)." If the correct response did not then occur, T modeled the behaviors involved and then repeated his instruction. As before, if the correct response still did not occur T provided physical guidance as needed for S to perform the behaviors involved. Praise and applause were provided when the correct response occured.

First pre-addition exercise (Task VI). No measures of Ss' performance on this task were obtained prior to the outset of the program; however, the first trial in this task was conducted under testing conditions:

> T placed a mimeographed slip of paper, on which appeared an addition problem with correct quantities of lines drawn under both numerals, in front of S and asked him to, "Count all the lines (pointing to the lines under both numerals) and write the total here (pointing to the horizontal line provided for the answer to the addition problem)." The problem was removed from view with no indication of accuracy; a different problem was given to the next S, and the instruction was repeated. The procedure was continued until each S had responded to all 10 problems in the set.

The procedures used to obtain these measures were also used to teach this task, except that the consequences of each response were determined by the accuracy of that response. In addition, T faded his verbal directions during the first teaching trial, so that in subsequent trials Ss responded to the problems presented without verbal cues or instructions. Edibles, praise and applause immediately followed each correct response. When an incorrect response occurred, S was given a duplicate slip and asked to, "Try again. Count all these lines (pointing to the lines under both numerals) and write the total here (pointing to the horizontal line provided for the answer to the addition problem)." If the correct response did not then occur, T modeled the behaviors involved and then repeated his instruction. The desired response consistently followed this procedure. Praise and applause followed the correct response.

Second pre-addition exercise (Task VII). No measures of Ss' performance on this task were obtained prior to the outset of the program; however, the first trial in this task was conducted under testing conditions:

> T placed a mimeographed slip of paper, on which appeared an addition problem with the correct quantity of lines drawn under only the first numeral, in front of S and instructed him to, "Draw the right number of lines under this numeral (pointing to the second numeral); then count all the lines, and write the total." S's response was scored as correct if he wrote the appropriate numeral. After S had responded, the problem was removed from view with no indication of accuracy; a different problem was given to the next S, and the instruction was repeated. This procedure was continued until each S had responded to all 10 problems in the set.

The procedures used to obtain these measures were also used to teach this task, except that the consequences of a response were determined by the accuracy of that response. T faded his verbal instruction during the first teaching trial so that in subsequent trials Ss responded to the problems without verbal cues or instructions. Edibles, praise and applause followed immediately when S wrote the correct numeral in the space provided. When an incorrect response occurred, T gave S a duplicate problem and instructed him to, "Try again. Draw this many lines (pointing to the second numeral); then count all the lines and write the total." If the correct response still did not occur, T's modeling of the behaviors involved was sufficient to produce the correct response. Praise and applause followed the correct response.

Addition (Task VIII). Baseline measures of Ss' performance on addition were taken prior to teaching of any task. The following procedures were used:

> T gave S a mimeographed slip of paper, on which an addition problem was printed, and instructed him to, "Draw the right number of lines under both numerals, then count all the lines and write the total." A response was scored correct when S wrote the appropriate numeral; no indication of accuracy was given. T then gave a different problem to the next S and repeated his instruction. The procedure was continued until each S had responded to all ten problems in the set.

The procedures used to obtain baseline measures were also used to teach addition, except that the consequences of a response were determined by the accuracy of that response. As before, T's instruction was faded during the first teaching trial so that Ss responded in subsequent trials to the problems without verbal cues or instructions. Edibles, praise and applause immediately followed each correct response. When the initial response was incorrect, T gave S a duplicate problem and instructed him to, "Try again. Draw the right number of lines under both numerals, then count all the lines, and write the total." Verbal instructions were sufficient in every case to produce the correct response. Praise and applause were given when the correct response occurred.

Results

The entire program required 268 trials and 130 hours of instructional time. Each of the four Ss made 10 discrete responses to instructional materials during each trial. The number of correct responses during a trial thus could range from 0 to 40. Criterion performance for each task was defined as 4 consecutive trials in which 40 correct responses were made. The attainment of this criterion with each task was followed by the introduction of the next task in the sequence. The initial trials of each teaching phase (Test Trials) were conducted under baseline conditions.

During the baseline period (Trials 1-2) Ss averaged: 31 correct responses to Task I; 21 correct responses to Task II; 35 correct responses to Task III; 21 correct responses to Task IV; 8 correct responses to Task V; and 0 correct responses to Task VIII. No baseline measures of performance on the two pre-addition exercises (Tasks VI & VII) were taken (Figure I-A)

Labeling printed numerals (Task I) was taught during Trials 3-69. The number of correct responses increased from 33 in Trial 3 to 40 in Trials 66-69 (Figure I-B).

Writing numerals from verbal cues (Task II) was taught during Trials 70-148. The number of correct responses averaged 21 in Trials 1-2 (Baseline) and 25.3 in Trials 70-72 (Test Trials), and increased to 40 in Trials 145-148 (Figure I-C).

Counting quantities of lines and reporting the total verbally (Task III) was taught during Trials 149-169. The number of correct responses averaged 35 in Trials 1-2 (Baseline) and 35.3 in Trials 149-151 (Test Trials), and increased to 40 in Trials 166-169 (Figure I-D).

Drawing quantities of lines corresponding to printed numerals (Task IV) was taught during Trials 170-191. The number of correct responses averaged 21 in Trials 1-2 (Baseline) and 24.6 in Trials 170-172 (Test Trials), and increased to 40 in Trials 188-191 (Figure I-E).

Counting quantities of lines and writing the total (Task V) was taught during Trials 192-208. The number of correct responses averaged 8 during Trials 1-2 (Baseline) and 32.6 in Trials 192-194 (Test Trials) and increased to 40 in Trials 205-208 (Figure I-F).

The first pre-addition exercise (Task VI) was taught during Trials 209-220. The number of correct responses increased from 15 in the initial Test Trial (Trial 209) to 40 in Trials 217-220 (Figure I-G).

The second pre-addition exercise (Task VII) was taught during Trials 221-245. The number of correct responses increased from 5 in the initial Test Trial (Trial 221) to 40 in Trials 242-245 (Figure I-H).

Addition (Task VIII) was taught during Trials 246-268. The number of correct responses averaged 0 in Trials 1-2 (Baseline) and 23 in Trial 246 (Test Trial) and increased to 40 in Trials 265-268. During the final 14 trials Ss never made fewer than 38 correct responses. It should also be noted that one S performed perfectly in every addition trial (Figure I-I).

Discussion

An instructional procedure, emphasizing the definition of behavioral objectives, the specification of entering behaviors, the construction of a sequence of intermediate behaviors, the systematic manipulation of the environment, and the application of measurement and evaluation procedures, was used successfully to teach four trainable students to perform simple addition problems correctly and consistently.

Basic to the teaching procedure was the arrangement of classroom events so that the presentation of defined instructional materials was the only discriminative stimulus for a student's initial response. If this response was incorrect, an established sequence of contingencies was employed to give the least help necessary for the correct response to occur and be reinforced. This approach is consistent with Skinner's analysis that, "A distinction must be made between two kinds of help. The teacher helps the student respond on a given occasion, and he helps him so that he will respond on similar occasions in the future. He must often give him the first kind of help, but he is teaching only when he gives him the second. Unfortunately, the two are incompatible." (Skinner, 1968, p. 216)

The use of edibles does not deny the effectiveness of contingent teacher attention and the reinforcing value of many naturally occurring classroom events. Rather, it reflects an effort to strengthen the teacher's verbal control over the students' behavior by systematically pairing his complimentary comments with the presentation of an edible (Bijou, Birnbrauer, Kidder and Tague, 1966).

The efficacy of individually paced instructional programs which minimize the possibility of failure has received considerable attention in recent literature (e.g., Skinner, 1968). The application of this approach in many public school classrooms is impeded, for example, by expensive or unavailable instructional materials, insufficient personnel, inadequate equipment, and untoward classroom arrangements. Some evidence is available, however, that group instruction procedures may be more effective than individual instruction under some conditions (Brown, Hermanson, Klemme, Haubrich & Ora, 1970). The group instruction procedure reported here was effective in developing the desired arithmetic skills. In addition, anecdotal reports suggest that the procedure stimulated appropriate responses to moderate failure. That is, the teacher's reports indicate that failure to obtain reinforcement appeared to serve as a cue for behaviors associated with attending to the reinforced responses of other students. If trainable students are indeed expected to function in the community where they likely will encounter some failure, procedures such as this, which seem to teach appropriate responses to failure, appear significant (McGee, 1970).

No attempt was made to teach "number sense" or a "concept of addition." Rather, some of the behaviors from which these constructs are often inferred were taught directly. Certainly, a variety of other behaviors are frequently associated with addition abilities. These include, for example, accurate performance on more complex computations, the application of addition skills to problems involving measurement, money, and time telling, and the elimination of lines drawn by the students. The success of this demonstration suggests, however, that the behaviors involved in these more complex skills may be taught directly, just as the behaviors involved in simple addition were taught here.

The correlational data obtained in this demonstration does not provide the precise procedural evaluation that could have resulted from more stringent experimental manipulations. Evidence suggesting replicability is available, however, in a successful application of similar procedures to teach simple addition to younger trainable students (Brown, Bellamy, Gadberry, and Sontag, 1971).

Optimism is warranted. Instructional procedures are being identified which do result in the acquisition of academic skills by trainable students. The success of these procedures indicates that concentration on self-care and social behaviors to the exclusion of academic content is increasingly less tenable in trainable programs. Of current concern must be the use of validated procedures to teach basic academic skills as early as possible in a trainable student's education. In this way longitudinal academic objectives based on empirical success may replace objectives based on intellectual impairments inferred from failure.

FIGURE 1

Number of correct responses to instructional materials during: A) Baseline; B) Task I; C) Task II; D) Task III; E) Task IV; F) Task V; G) Task VI; H) Task VII; I) Task VIII.

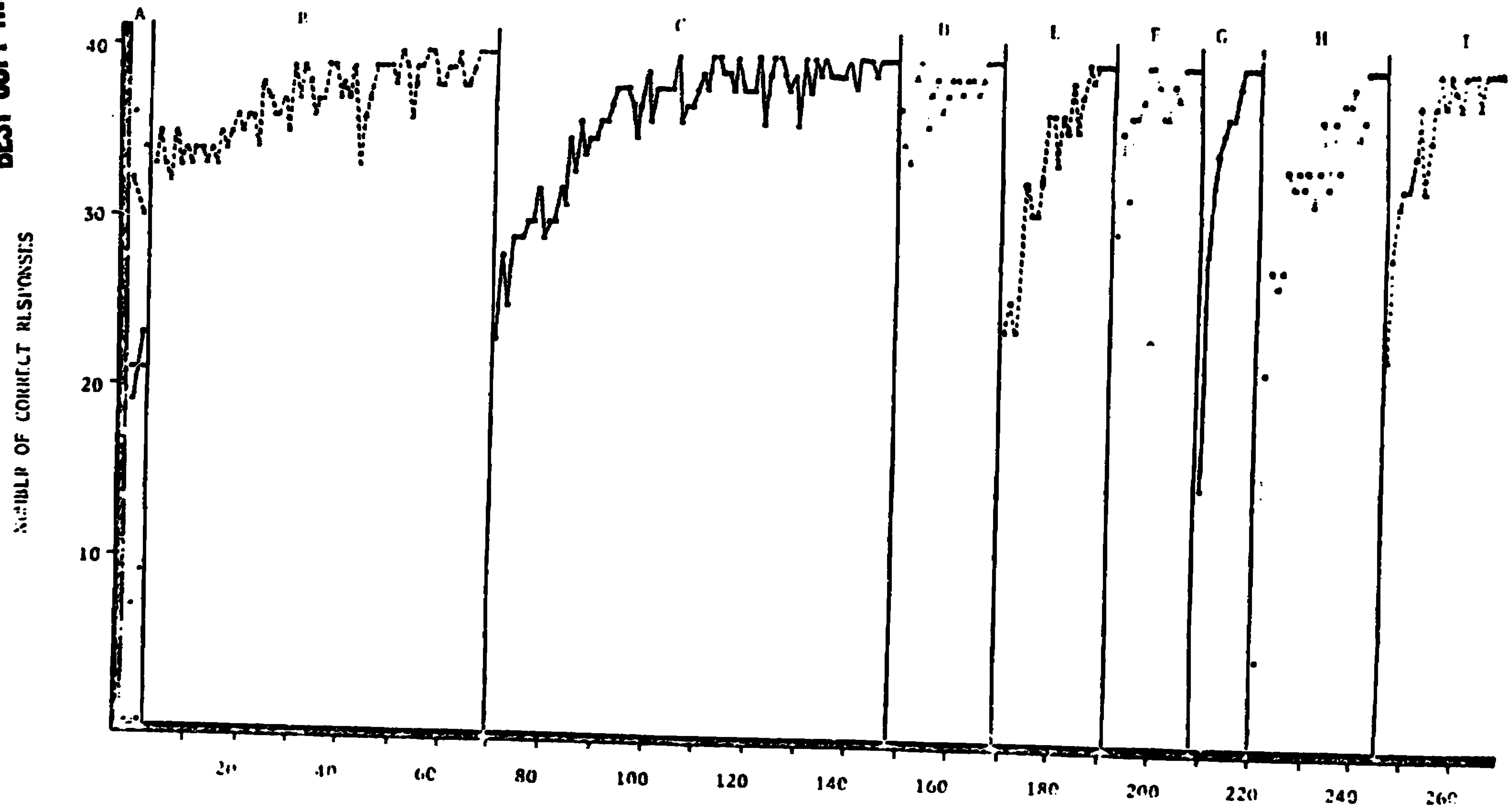
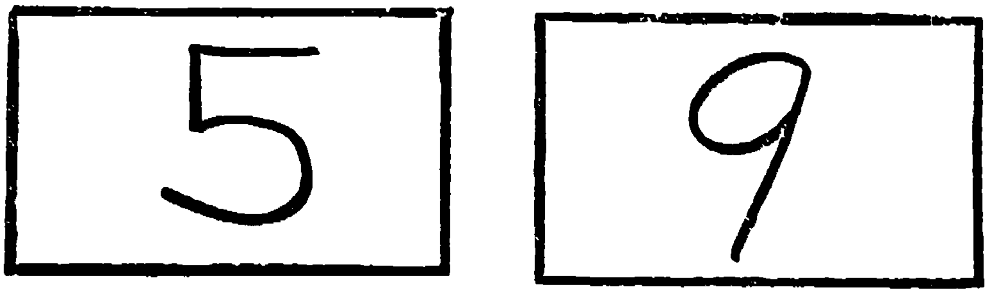

NUMBER OF CORRECT RESPONSES
10
20
30
40
A
B
C
D
E
F
G
H
I
20
40
60
80
100
120
140
160
180
200
220
240
260
TRIALS

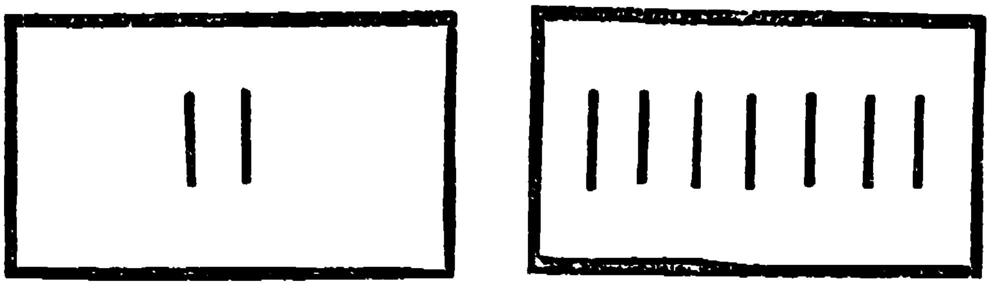
FIGURE 1

ILLUSTRATIONS OF INSTRUCTIONAL MATERIALS USED IN VARIOUS TASKS

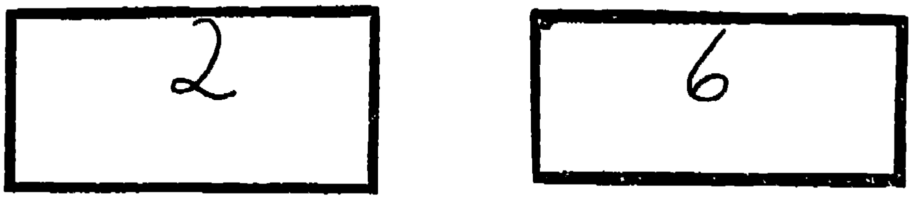
TASK I



TASK III

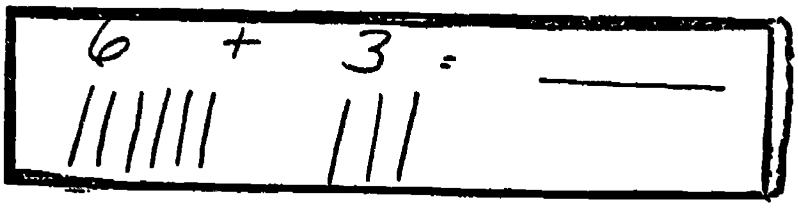


TASK IV

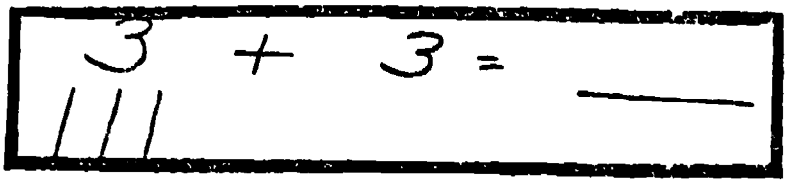


TASK V

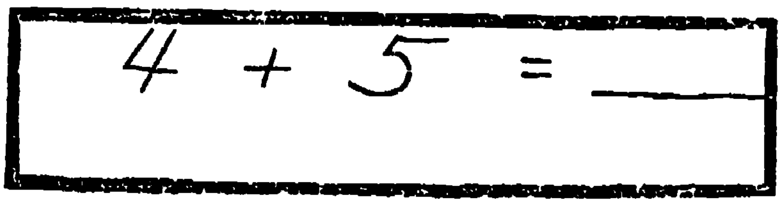
TASK VI



TASK VII



TASK VIII



References

Baer, D. M., Wolf, M. M., & Risley, T. R. Some current dimensions of applied behavior analysis. Journal of Applied Behavior Analysis, 1968, 1, 91-97.

Bandura, A. Principles of behavior modification. New York: Holt, Rinehart and Winston, 1969.

Bijou, S. W. The mentally retarded child. Psychology Today, 1968.

Bijou, S. W., Birnbrauer, J. S., Kidder, J. D., & Tague, C. Programmed instruction as an approach to teaching of reading, writing, and arithmetic to retarded children. Psychological Record, 1966, 16, 505-522.

Birnbrauer, J. S., & Lawler, J. Token reinforcement for learning. Journal of Mental Retardation, 1964, 2, 275-279.

Brown, L., Bellamy, T., & Gadberry, E. A procedure for the development and measurement of rudimentary quantitative concepts in low functioning trainable students. Training School Bulletin, in press.

Brown, L., Bellamy, T., Gadberry, E., & Sontag, E. Teaching addition to young trainable students: A sequential procedure. Paper presented at Wisconsin Association for Retarded Children, Annual Convention, Rhinelander, Wisconsin, May, 1971.

Brown, L., Hermanson, J., Klemme, H., Haubrich, P., & Ora, J. Using behavior modification principles to teach sight vocabulary. Teaching Exceptional Children, 1970, 2, 120-128.

Brown, L., & Perlmutter, L. Teaching functional reading to trainable level retarded students. Education and Training of the Mentally Retarded, 1971, 6, 74-84.

Coleman, R. A pilot demonstration of the utility of reinforcement techniques in trainable programs. Education and Training of the Mentally Retarded, 1970, 5, 68-70.

Crosson, J. E. A technique for programming sheltered workshop environments for training severely retarded workers. American Journal of Mental Deficiency, 1969, 73, 814-818.

Dunn, L. M. (Ed.) Exceptional children in the schools. New York: Holt, Rinehart and Winston, 1963.

Gardner, W. I. Behavior modification in mental retardation. Chicago: Aldine Atherton, 1971.

Goldberg, I. I., & Rooke, M. L. Research and educational practices with mentally deficient children. In N. G. Haring and R. L. Schiefelbusch (Eds.) Methods in special education. New York: McGraw Hill, 1967, 112-136.

Haring, N. G. Attending and responding. San Rafael, California: Dimensions Publishing Company, 1968.

Holland, J. G. & Skinner, B. F. The analysis of behavior: A program for self-instruction. New York: McGraw Hill, 1961.

Huddle, D. D. Work performance of trainable adults as influenced by competition, cooperation, and monetary reward. American Journal of Mental Deficiency, 1967, 72, 198-211.

Kirk, S. A. Public school provisions for severely retarded children. Albany: New York State Interdepartmental Health Resources Board, 1957.

Kirk, S. A. Research in education. In H. A. Stevens and R. Heber (Eds.) Mental retardation: A review of research. Chicago: University of Chicago Press, 1964.

Lent, J. R. and Childress, D. C. A demonstration program for intensive training of institutionalized mentally retarded girls. Detailed progress report, Public Health Service Grant No. MR 1 861 C69, 1970.

Lindsley, O. R. Direct measurement and prosthesis of retarded behavior. Journal of Education, 1964, 147, 62-81.

McCarthy, J. J., & Scheerenberger, R. C. A decade of research on the education of the mentally retarded. Mental Retardation Abstracts, 1966, 3, 481-501.

McGee, J. Moderate failure as an instructional tool. Exceptional Children, 1970, 36, 757-761.

Screven, C. G., Straka, J. A., & LaFond, R. Applied behavioral technology in a vocational rehabilitation setting. In W. I. Gardner, Behavior modification in mental retardation. Chicago: Aldine Atherton, 1971.

Skinner, B. F. Science and human behavior. New York: The Free Press, 1953.

Skinner, B. F. The technology of teaching. New York: Appleton-Century-Crofts, 1969.

Skinner, B. F. Contingencies of reinforcement. New York: Appleton-Century-Crofts, 1969.

Whaley, D. L., & Malott, R. W. Elementary principles of behavior. Kalamazoo, Michigan: Behaviordelia, 1968.

ABSTRACT

A stimulus-fading procedure was used to teach three emotionally disturbed educable retarded students to discriminate appropriate mathematical operations. Initially the students knew how but not when to add or subtract. A series of stimuli (teacher instructions) and correlated responses culminating in the performance of the criterion response (correct discrimination) was arranged. When the students could perform the criterion response the verbal instructions were systematically faded. Results indicate that the procedure was effective in that the students learned to discriminate addition and subtraction word problems.

Use of a Stimulus-Fading Procedure
to Teach Retarded-Emotionally Disturbed Students
to Discriminate Mathematical Operations[1]

Lou Brown, Richard E. Shores, and Eve Pearce Gadberry

University of Wisconsin and Madison Public Schools

Historically, the rather tenuous empirical justification for special education classes for educable mentally retarded (EMR) students has resulted in the extension that perhaps many of these students are not capable of acquiring complex academic skills. Quite often this extension has led to the exclusion of complex academic skills from the content covered in classrooms. An alternate extension, however, is that the general lack of empirical success is a function of a deficient instructional technology and that, given adequate techniques to alleviate specific learning problems, a teacher could easily demonstrate, empirically, the success of her special class. In our view, the validity of the extension that educational success is a function of teaching technology requires that we make concentrated efforts to improve the instructional competence of special class teachers by demonstrations of improvements in instructional technology.

One major source of this vital instructional technology is the

[1]This demonstration was supported in part by NICHD Grant 5 P01 HD 03352 to the University of Wisconsin Center on Mental Retardation and by the State of Wisconsin, Title VI-A, ESEA, Project #00030 in cooperation with the Madison Public Schools.

psychology learning laboratory. In recent years, it has been repeatedly demonstrated that many of the learning principles established in psychology laboratories are relevant to the instructional needs of special class teachers (Hewett, 1968; Madsen and Madsen, 1969; Sloane and MacAulay, 1968). That is, special educators have applied laboratory learning principles to practical classroom problems with resulting instructional success.

The practical classroom problem confronted here was the inability of students to consistently solve arithmetic word problems. While the students could read and compute the problems when told which operation to perform (add or subtract), they were unable, upon reading the problem, to decide for themselves the required operation (adding or subtracting). That is, they knew how but not when to add and subtract. The instructional objective thus became that of arranging the learning environment so that the students could discriminate between stimuli that indicated addition and stimuli that indicated subtraction. One method of teaching this kind of a discrimination is to use one of several fading techniques (Terrace, 1963a,b; Whaley and Malott, 1968).

In the fading technique used here the students were presented a series of stimuli (instructions from the teacher) and asked to perform a series of responses. These instructions and responses culminated in the performance of the correct discrimination (criterion response). When the students could perform the criterion response, the teacher systematically faded (did not provide) the instructions and the demands for the overt performance of all responses but the criterion response, until the students could make the criterion response without the aid of the teacher.

The specific steps involved are as follows:

Step I. A criterion response representing the students' ability to discriminate between an addition and a subtraction problem was defined and measured.

Step II. A group of verbal instructions were arranged in a series in such a way that if the students responded appropriately to each instruction their chance of making the criterion response would be maximized.

Step III. The teacher insured that each student could perform the responses in the series.

Step IV. Using the four verbal instructions, the teacher guided the students through all the responses in the series, including the criterion response.

Step V. The four verbal instructions were systematically faded until the students could perform the criterion response without the aid of the teacher.

METHOD

Students

The three students in this demonstration were 16 years of age and had obtained IQ scores of 55, 58, and 67. Depending upon the agency to which they had been referred, they had been diagnosed as EMR, psychotic, emotionally disturbed or brain damaged. Two of the three had been hospitalized in a state mental institution.

The entire demonstration was conducted by teachers in a public school special education classroom. A teacher aide worked with the two remaining students in the class when the demonstration was in progress.

Teaching Materials Used

Three different teaching materials were used: A) two tests (test problems) were used alternately to measure the students' ability to discriminate the correct operations; B) flash cards were used to build differential responses to the operational cues; and C) problems were constructed and used to teach discrimination of the correct operations (practice problems).

Each of the two sets of test problems used to measure the students' ability to discriminate the correct operations consisted of ten addition and ten subtraction word problems. These problems were taken from a fourth grade level program mathematics textbook (Sullivan, 1960) and printed on 8-1/2" by 11" mimeograph paper.

Two sets of flash cards were constructed. One set contained four cues indicating addition (<u>in all</u>, <u>all together</u>, <u>sum</u>, <u>total</u>). The other set contained four cues indicating subtraction (<u>less than</u>, <u>minus</u>, <u>take away</u>, <u>are remaining</u>).

Two sets of practice problems were constructed. One set contained eight addition problems representing each of the four addition cues twice. The second set contained eight subtraction problems representing each of the four subtraction cues twice. These practice problems were similar to the test problems but involved different numbers, words and answers. For example, a test problem for addition might read: "Sally spent 18 cents for paper and 10 cents for a pencil. What was the total amount of money spent?" A practice problem might read: "A small board was seven feet long. A large board was twelve feet long. What was the total length of the two boards?"

<u>General Teaching Design</u>

The design used to assess the efficacy of the teaching technique was a modification of the "multiple baseline design" (Baer, Wolf, & Risley,

1968) in which each student served as his own control. That is, the test problems were administered to obtain a measure of each students' ability to discriminate addition and subtraction operations. Each student was then taught to recognize the addition operations in the addition practice problems. When the students could successfully recognize addition operations, they were then taught to recognize subtraction operations in the subtraction practice problems. However, performance on the test problems was measured throughout.

This design is particularly relevant for classroom teachers interested in assessing the effectiveness of their teaching techniques, instructional materials, etc. in that it allows the teacher to give the same students exposure to two or more different teaching procedures in the same day and select those that are most effective for each child.

The entire teaching procedure consisted of three major components: A) establishing a baseline; B) teaching the discrimination of addition operations; and C) teaching the discrimination of subtraction operations.

Establishing a Baseline

The term baseline as it is used here is essentially what many teachers call a good academic inventory. That is, a baseline is designed to provide the teacher with information concerning the levels at which her students are currently functioning. When the current level of functioning is determined, the teacher systematically arranges her classroom environment so that the level of each child is modified in the desired direction.

Two essential components of a baseline are: 1) a definition of the response that is to be measured; and 2) the actual measurement of the response. The response measured was an arithmetic sign (+ or -) recorded by the student in the margin beside an arithmetic word problem. The actual measurement of the response was obtained by alternately administering the two sets of test problems for five consecutive school days before teaching was initiated (Step I). Although the baseline period consisted of only five days, the two tests were administered alternately throughout the entire 17 day demonstration. It was assumed that the effects of teaching, if any, would be reflected in changes in the baseline performance.

Teaching the Discrimination of Addition and Subtraction Operations

After the teacher had defined and measured the criterion response, she ordered a series of verbal instructions (discriminative stimuli) and correlated responses she considered prerequisites for the performance of the criterion responses (Step II). The instructions and correlated responses are as follows:

A. Teacher: "Read the problem out loud." Students: (The students responded by reading the problem aloud.)

B. Teacher: "What is the key word or words in that problem and what do you do when you see those words?" Students: (The students responded by reading the key words aloud and providing the correct operation.)

C. Teacher: "Underline the key word or words with your pencil." Students: (The students did so.)

D. Teacher: "Put the sign that tells you what to do in the margin." Students: (The students did so.)

Once the teacher determined the prerequisite instructions and correlated responses, she then had to insure that all the responses were in the repertoire of each student (Step III).

At this point the teacher decided that it was quite likely that the students would have unusual difficulty performing one of the prerequisite responses. The response in question was the students' reading the operational cue and then verbalizing what operation should be performed. Thus, prior to guiding the students through the series, the teacher had to build this response (Lindsley, 1969). The technique used to build this response is essentially that used by Staats et al. (1964) and Brown et al. (1970) and is presented below:

> The three students were seated at a table facing the teacher. The teacher presented one of the four addition cues on flash cards and said to one of the students, "What does this word say?" When the student correctly labeled the cue words the teacher said, "Good, now what do you do when you see this word in a problem?"
>
> If the student said "add" the teacher then said, "Good, that's correct. When you see that word in a word problem, you add."
>
> If the student indicated he did not know the correct answer or gave a wrong answer, the teacher said, "I am sorry you didn't get the right answer. When you see this word in a problem you add. Now, what do you do when you see this word in a problem?" If the student matched the response the teacher had modeled, he was reinforced immediately with such statements as: "Good, great, you are doing fine." If the student did not correctly match the response provided by the teacher, the procedure was repeated. (In no instance did the teacher have to model the response more than twice.)
>
> When a student had an opportunity to label an operation after reading a cue, another student was then given the opportunity to label an operation after reading a second cue. This procedure was continued until each student had a chance at labeling an operation for each of the four addition cues.

After three 15 minute training sessions, each of the three students could verbally indicate the correct operation when any of the four addition cues were presented.

Once it had been assured that each student had the required responses in his repertoire the teacher taught the students to respond differentially to each of the four verbal instructions (Step IV). This was accomplished by the teacher reciting the directions and waiting for the students to respond appropriately. For example, if the teacher said, "Read the problem aloud," she would listen until the students had done so. If each student read the problem aloud she congratulated them with such statements as, "Good," "Fine," "Great," "You are doing well." If any student failed to read any of the words correctly, the teacher would say, "I am sorry, we will have to read the problem again because ________ did not know all the words."

This procedure was followed until each student responded appropriately to each of the four instructions on each of the eight practice addition problems.

The fifth major step in the teaching procedure involved the systematic fading (removal) of the instructions until the students could perform the criterion response appropriately when instructed to place the correct sign beside the problem. This was done in the following stages: When the students demonstrated that they could, without the guidance of the teacher, A) read the eight addition practice problems aloud; B) verbally label the operational cues and verbally report the correct operations; C) underline the operational cues with a pencil; and D) record the correct signs in the margin, reading the problem aloud was faded. The two remaining instructions were then faded in order until all the teacher did was give the practice problems to the students and instruct them to put the correct signs in the margin.

Exactly the same procedures were followed when teaching the discrimination of subtraction operations. That is, flash cards with subtraction cues were used and subtraction practice problems were substituted for addition practice problems.

RESULTS

The three students were given 17 daily tests (alternate forms) of their ability to discriminate the correct mathematical operations. The tests were always administered immediately after completion of the teaching procedures. Daily performance records of each student were available for evaluation. However, since the three students performed similarly, only a group performance graph is presented (see Figure 1).

Insert Figure 1 about here

Baseline Performance

During the five day baseline period the three students correctly discriminated an average of 15 of a possible 30 or 50% of the addition operations and an average of 12 of a possible 30 or 40% of the subtraction operations.

Effects of Training to Discriminate Addition Operations

The students received training specific to discriminating the addition operations during days 6-10. As can be seen from inspecting Figure 1, during days 9 and 10 the three students were functioning at 100% efficiency in addition on the test problems.

At day 6 the students responded correctly to each of the four instructions on the eight addition practice problems and successfully discriminated 23 or 76% of the operations on the test problems. At day 7 instructions to read the problems aloud were faded; at day 8 instructions to verbally report the correct operation were faded; and at day 9 instructions to underline the cue were faded.

Figure 1 suggests that the fading procedure was successful in teaching the students to discriminate addition operations. That is, prior to the initiation of the fading procedure (days 1-5) the students successfully discriminated only 50% of the addition test problems, while at days 9 and 10 they successfully discriminated 100% of the addition test problems.

During days 6-10, however, they averaged only 50% success in discriminating subtraction operations. When the performance of the students on the two types of problems is compared during days 6-10, it can be seen that they successfully discriminated an average of 27 or 90% of the addition test problems and an average of 15 or 50% of the subtraction test problems.

Effects of Training to Discriminate Subtraction Operations

At days 9 and 10, the students could discriminate 100% of the addition operations but only 58% of the subtraction operations. At day 11, the teacher began teaching when to subtract in exactly the same manner in which adding was taught. Thus, at day 10 training to discriminate addition operations was terminated and at day 11 training to discriminate subtraction operations was initiated. However, the students were continually tested on their ability to discriminate addition operations through day 17.

At day 11, after a 30 minute training session, each of the three students could verbally indicate the correct subtraction operation when any of the four subtraction cues were presented. Immediately after the completion of the flash card drill, the teacher guided the students through the instructions and responses necessary to make an appropriate subtraction criterion response on the eight subtraction practice problems. As a result of these procedures, their performance on the test problems improved.

At day 12 instructions to read the problems aloud were faded; at day 13 instructions to verbally label the operational cues and verbally report the correct operations were faded. At day 14 instructions to underline the cues were faded and there was a decrement in performance. At day 15 the students were again instructed to underline the relevant cues in the subtraction practice problems. Performance on the test problems returned to 100% correct, and so at day 16 instructions to underline the cues were faded.

Figure 1 suggests that the stimulus-fading procedures were successful in teaching the students to discriminate subtraction operations. That is, during days 1-5, the students correctly discriminated only 40% of the correct subtraction operations. During days 6-10 their performance improved to an average of 50% per day. One explanation for this improvement in performance is the change in the probability of a correct guess. That is, initially the students were told that they could put a sign in the margin indicating addition, subtraction, multiplication, or division. When they learned to use the addition sign appropriately, they also learned when not to use the addition sign. It is likely that this development increased the probability that a subtraction sign would be recorded. During days 11-17, while the stimulus-fading procedures were in effect, the students correctly discriminated an average of 93% of the subtraction operations on the subtraction test problems.

A follow-up test two weeks later indicated that the students were continuing to perform at a high level (100% correct for adding and 96%

for subtracting).

DISCUSSION AND IMPLICATIONS

The changes in the performance level strongly suggests that the stimulus-fading procedure was effective in teaching the students to discriminate between addition and subtraction operations. Moreover, the follow-up test two weeks after instruction had been terminated suggests that the students had retained the skill they had acquired. These outcomes support the findings of psychologists (Terrace, 1963a,b; Whaley and Malott, 1968) and educators (Fernald, 1943; Cruickshank and Associates, 1961) who have demonstrated that fading procedures can be used to develop behaviors that were quite difficult to develop using other methods.

The use of a multiple baseline design in practical educational settings by instructional staff is a relatively new development. This design seems quite sensitive to daily changes in student behavior which are a direct reflection of the effectiveness of the teaching procedures being utilized. In addition, this evaluation tool, and others like it (Sidman, 1960; Lindsley, 1969) might prove to be more relevant, efficient, and functional than the more traditional academic achievement tests.

Finally, the writers feel that when a teacher enters a room of retarded students she has at her command a body of knowledge of which a crucial component is an instructional technology. It is our view that this technology should be based on empirically established learning principles. The more potentially applicable learning principles a teacher has in her technological repertoire, the more competent she is to meet the daily myriad of unique instructional problems. That is, given a specific behavioral deficit, the teacher should have the command of several learning principles that could be expected to contribute to the remediation of that deficit. In this demonstration, the particular learning problem was the inability of the students to discriminate appropriate addition and subtraction operations and the major learning principles applied were stimulus-fading and contingent social reinforcement. In addition, modeling, response building and response differentiation were also used. If the instructional problem had been different, the teacher might have selected or emphasized different learning principles (Bandura, 1969; Homme, 1969).

References

Baer, D., Wolf, M.M., & Risley, T. Current dimensions of applied behavior analysis. Journal of applied behavior analysis, 1968, 1, 91-97.

Bandura, A. Principles of behavior modification. New York: Holt, Rinehart & Winston, Inc., 1969.

Brown, L., Klemme, H., Hermanson, J., Haubrich, P., & Ora, J. Teaching sight vocabulary to trainable level students utilizing the systematic application of behavior modification principles. Teaching exceptional children, Spring, 1970.

Cruickshank, W., Bentzen, F., Ratzeburg, F., & Tannhauser, M. A teaching methodology for brain-injured and hyperactive children. New York: Syracuse University Press, 1961.

Fernald, G. Remedial techniques in basic school subjects. New York: McGraw-Hill Book Co., 1943.

Hewett, F. M. The emotionally disturbed child in the classroom. Boston: Allyn & Bacon, Inc., 1968.

Holland, J. G. & Skinner, B. F. The analysis of behavior. New York: McGraw-Hill Book Co., Inc., 1961.

Homme, L. How to use contingency contracting in the classroom. Champaign, Ill.: Research Press, 1969.

Lindsley, O. R. Direct measurement and prosthesis of retarded behavior. Curriculum bulletin, June, 1969.

Madsen, C. & Madsen, C. Teaching/discipline. Boston: Allyn and Bacon, 1969.

Sidman, M. Tactics of scientific research. New York: Basic Books, Inc., 1960.

Sloane, H. & MacAulay, B. (eds.) Operant procedures in remedial speech and language training. Boston: Houghton Mifflin Co., 1968.

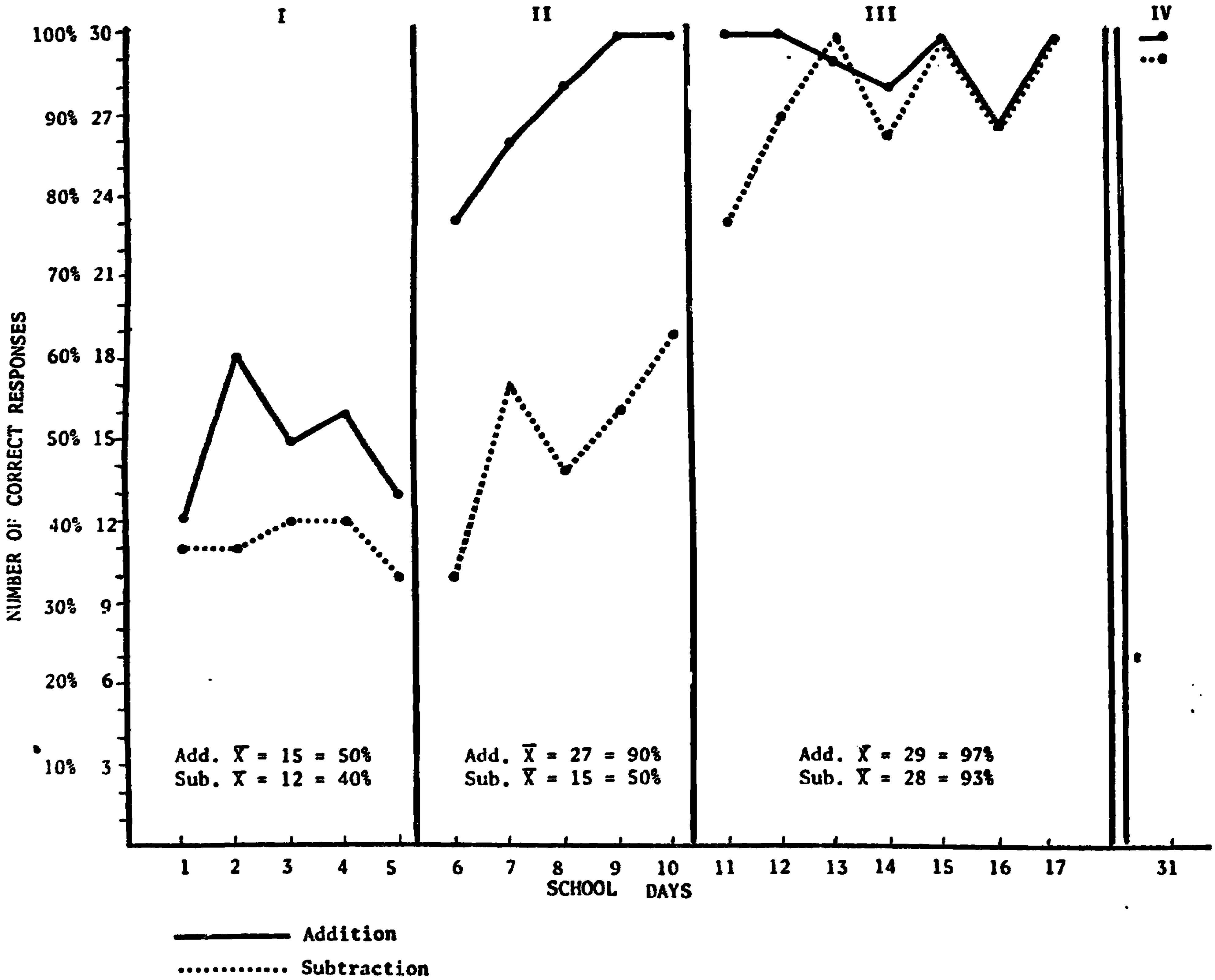
Staats, A., Finley, J., Minke, K. & Wolf, M. Reinforcement variables in the control of unit reading responses. Journal of the experimental analysis of behavior, 1964, 7, 139-149.

Terrace, H. S. Discrimination learning with and without "errors". Journal of the experimental analysis of behavior, 1963a, 6(1), 1-27.

____________. Errorless transfer of a discrimination across two continua. Journal of the experimental analysis of behavior, 1963b, 6(2), 223-232.

Whaley, D. & Malott, T. Elementary principles. Kalamazoo, Mich.: Behaviordelia, 1968.

List of Figures


NUMBER OF CORRECT RESPONSES
I
II
III
IV
100% 30
90% 27
80% 24
70% 21
60% 18
50% 15
40% 12
30% 9
20% 6
10% 3
Add. $\bar{X}$ = 15 = 50%
Sub. $\bar{X}$ = 12 = 40%
Add. $\bar{X}$ = 27 = 90%
Sub. $\bar{X}$ = 15 = 50%
Add. $\bar{X}$ = 29 = 97%
Sub. $\bar{X}$ = 28 = 93%
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 31
SCHOOL DAYS
Addition
Subtraction

Lou Brown, Ph.D., Assistant Professor, Department of Studies in Behavioral Disabilities, University of Wisconsin; Consultant-Madison Public Schools, Madison, Wisconsin.

Richard E. Shores, Ed.D., Assistant Professor, Department of Studies in Behavioral Disabilities, University of Wisconsin, Madison, Wisconsin.

Eve Pearce Gadberry, Teacher, Madison Public Schools, Madison, Wisconsin.

Language papers

A retarded or emotionally disturbed student's ability to utilize language deemed appropriate in a variety of settings may well determine the extent of his social life, the result of his recreational ventures and the success of his vocational and domestic placements. Language skills taught to date include speaking in sentences (Brown and Klemme, 1970) and following verbal directions (Brown, Bellamy, Tang and Klemme, 1971). Teaching procedures are presented below:

A PROCEDURE FOR TEACHING TRAINABLE STUDENTS TO FOLLOW VERBAL DIRECTIONS[1]

Lou Brown, Tom Bellamy,
Pearl Tang, and Hope Klemme

University of Wisconsin and
Madison Public Schools

There may be hundreds of instances in the course of a school day when a teacher has to make decisions about what behavior students should be performing at a particular time. Obviously, the most efficient method of communicating to a student the specific behavior he is to perform is for the teacher to give verbal directions. Apparently, the majority of public school students are either able to follow verbal directions by the time they enter school or acquire the necessary behaviors soon thereafter.

Consider the situation in which a teacher is confronted with a group of students who have not learned to follow verbal directions. What can a teacher do when she has little verbal control over the actions of her students? One available recourse is to perform the behavior herself. The teacher can get the milk and cookies, distribute paint and brushes, open each book to the desired page, etc. A second recourse is to model the desired behavior and hope that the students imitate her. The teacher can go to the closet, take out her coat, put it on and stand by the door, assuming all the time that each student will do exactly what she has done. A third possible recourse is to prime or guide each student through the chain of behaviors desired. The teacher can escort each child down the hall to the bathroom, help each child secure the materials for each lesson, etc.

It should be obvious from the aforementioned examples that a basic prerequisite for maximal use of instructional time and energy is the teacher's verbal control over the motor behavior of the students.

Historically, trainable students have not been the world's best direction followers. A crucial issue confronting teachers of trainable students, therefore, is whether the students are intellectually incapable of learning to follow verbal directions or whether they can learn to follow such directions if an appropriate instructional environment can be arranged. If the former assumption is made, the teacher must be content with the inefficient use of time and energy which results from the various nonverbal methods of inducing desired behaviors. On the other hand, if the teacher assumes that trainable students can learn to follow verbal directions, she then has the responsibility to devise a teaching procedure that will result in the acquisition of these basic and necessary behaviors.

Several writers concerned with instructional programs for trainable students have recognized the importance of a teacher establishing verbal

---

[1]This demonstration was supported in part by NICHD Grant 5 P01 HD 03352 to the University of Wisconsin Center on Mental Retardation and in part by funds from the Wisconsin Alumni Research Foundation.

control of the behavior of her students (Dunn, 1963, Goldberg and Rooke, 1967). In fact, one of the often stated objectives of programs for trainable students is to "teach them to follow simple directions".

The purpose of this paper is to detail specific procedures for teaching direction following which have been used with some success in a classroom situation. The program was occasioned by comments made by the teacher of a class of low-functioning trainable students: She indicated that her students had a great deal of difficulty following all but the most simple directions. Specific examples of her directions were obtained, and a procedure was devised to increase the correct responses of the students to her directions. The students' ability to respond to very simple (one-component) directions was first perfected; then the students were taught to respond correctly to two-component directions. Finally, attempts were made to teach three-component directions.

Method

Students

Initially, nine students were randomly assigned to two groups of four and five; however, due to individual performance records, the teacher decided to restratify on the basis of acquisition rates. Four students (Group A) ranged in age from 12.7 to 20.6 ($\bar{X}$=18.0), in I.Q. from 33 to 44 ($\bar{X}$=38), and had been enrolled in public school programs from four to ten years ($\bar{X}$=7.25). Five students (Group B) ranged in age from 16.10 to 20.10 ($\bar{X}$=18.6), in I.Q. from 25 to 39 ($\bar{X}$=32.4), and had been enrolled in public school programs from four to twelve years ($\bar{X}$=7.6).

Reports of educational, medical, psychological and psychiatric evaluations contained diagnoses such as trainable mentally retarded, emotionally disturbed, psychotic, prenatal damage of nonspecific origin, unknown genetic abnormality, tuberculosis meningitis, Downs syndrome and cerebral palsy. Comments such as "passivity and negativism", "no eye-hand coordination", "extremely weak in motor skills", "no attention span", "head shaking, eye-squinting mannerisms", "can't follow directions", and "lazy and unmotivated" were also found in these reports.

Materials

Three sets of directions were constructed using objects typically present in a classroom. Set I consisted of the following five statements: 1) "Pick up the paper from the floor." 2) "Close the door." 3) "Bring me the scissors from my desk." 4) "Put the pencil on the table." 5) "Open the door." Set II consisted of 1 and 3; 5 and 4; 1 and 5; 3 and 2; 4 and 2; and Set III consisted of 1, 3 and 2; 4, 2 and 5; 5, 1 and 4; 3, 5 and 2; 1, 4 and 3.

Data sheets were constructed and used to record the initial response of each student to each direction. Each group of students was seated around a typical classroom table with a teacher (T) or teacher-aide simultaneously teaching the two groups.

Teaching and Measurement Procedures

General Teaching Design

Most teachers do not have the time, inclination, or training to employ control groups or group statistics to evaluate educational progression; nor can teachers afford to wait months to use gain scores on standardized tests as indices of educational progress. Nevertheless, most teachers are, and should be, vitally concerned with verifying the effectiveness and relevance of their teaching procedures.

A seemingly realistic alternative to the use of annual gain scores and statistical inference is for the teacher to utilize measurement techniques employed by the applied behavior analysts (Baer, Wolf & Risley, 1968; Risley & Baer, in press). These measurement designs provide empirical evaluation of the effectiveness of a teaching procedure by requiring specific definition of behavioral objectives, direct and continuous measures of student responses, and a clearly delineated procedure. The multiple baseline design seems particularly well suited for classroom use (e.g., Brown, Bellamy & Gadberry, 1971; Brown, Jnores & Gadberry, 1970). The applicability of this design is limited, however, by the cumulative nature of many academic behaviors. That is, not only is their order of presentation partially predetermined, but also the development of a high rate of one behavior (crawling) may substantially affect the probability that another behavior (walking) will be emitted (Risley & Baer, 1971).

The behaviors involved in the three sets of directions in this demonstration appear cumulative. The design presented, therefore, is best viewed as a test-teach design into which many of the requirements of the multiple baseline, such as response definition, procedural specification, and direct, empirical measures of performance have been incorporated.

Initially, measures of responses to three sets of directions were obtained. The students were then taught correct responding to each of the three sets in turn. As soon as they could respond correctly to one set of directions, responding to all three sets was measured. The entire program was divided into the following phases: A) each student was asked to respond to 5 one-, two- and three-component directions respectively; B) each student was taught to respond correctly to the 5 one-component directions; C) repeat of phase A; D) each student was taught to respond correctly to the 5 two-component directions; E) repeat of phase A; F) attempts were made to teach each student to respond correctly to 5 three-component directions; G) repeat of phase A after a two-week retention period with those students who reached criterion in phase F.

Measurement procedures. In a measurement trial (Phases A, C, E & G) each student was asked to respond to all three sets of directions. The following measurement procedures were employed in the baseline and all subsequent measurement trials:

> When a group was seated around the table, T said: "I am going to give each of you some directions to follow. Sometimes I will ask you to do one thing, sometimes I will ask you to do two things and sometimes I will ask you do to three things. When I tell you to do two things, you should do the first thing I say and then do the second thing. When I tell

you to do three things you should do the first thing first, the second thing second and the third thing third." T then looked at one student and said, "Mary, pick up that paper from the floor." Each student was given 5 seconds to start reacting to the direction. If a student did not start reacting to the direction, or if he made the wrong response an error was recorded. If a student responded correctly to a direction the teacher simply said, "Thank you", and gave a different direction to a different student. When each student has been given an opportunity to respond to the 5 one-component directions, the procedure was repeated with the two-component and then the three-component directions.

Specific teaching procedures. The following teaching procedures were used to teach correct responding to the three sets of directions:

> T gave the first direction in a set to a student (e.g., "Open the door."). If the student responded correctly, T recorded the response and made such presumably reinforcing remarks as "Good", "Fine", "Let's clap for him class", and "That's right". If a student made an incorrect response, T recorded the response and repeated the direction. If the desired response did not ensue, another student in the group was asked to model the correct response. On the few occasions that a student still could not emit the correct response, T gave the direction, physically guided (primed) the student through the correct response and then reissued the direction. No student failed to respond correctly after priming was employed.

The procedure was then repeated with the remaining students in a group except that the same direction was never given to successive students.

When the group responded correctly to the one-component directions, the same procedures were used to teach the two- and three-component directions. The only notable departure from procedures occurred when it did not appear that several students would reach criterion on the three-component directions. At this point edibles (cereal or candy) were introduced as additional consequences for correct responding.

Results

Group A

On a single trial, an individual student could make from 0 to 5 correct responses to one of the 3 sets of directions. The number of correct responses made by the four students in Group A to a set of directions could, therefore, range from 0 to 20. Criterion was set at 2 consecutive trials in which the entire group responded perfectly to one of the 3 sets of directions.

During the baseline (trials 1-3), Group A averaged 19.3, 11.6, and 0.7 correct responses to the sets of 1-component, 2-component, and 3-component directions, respectively. (See Figure 1)

Only 3 trials (trials 4-6) were required for Group A to reach criterion on the 5 1-component directions. Perfect responding to the 1-component directions was maintained in the measurement phase which followed (trials 7-8).

In addition, the number of correct responses to the 2-component and 3-component directions during the second testing period is noticeably higher than during the baseline. While Group A averaged 11.6 correct responses to the 2-component directions and 0.7 correct responses to the 3-component directions during trials 1-3, during trials 7-8, they averaged 19.5 and 5.0 correct responses to the 2-component and 3-component directions respectively.

Group A was taught to follow the 2-component directions during trials 9-18. As can be discerned from Figure 1, perfect responding to both the 1-component and 2-component directions was maintained in the testing trials which followed (trials 19-20). Correct responding to the 3-component directions increased from an average of 0.7 during trials 1-3 to 5.0 in trials 7-8 to 8.5 in trials 19-20.

Fourteen trials were required to teach correct responding to the 3-component directions. Due to Christmas holidays, testing trials did not immediately follow the attainment of criterion performance on the 3-component directions. However, a test of retention was given after the 2-week school vacation, and S's responded perfectly to all 3 sets of directions.

<u>Group B</u>

Since there were 5 students in Group B, the number of correct responses to any set of directions in a particular trial could range from 0 to 25. During the baseline (trials 1-2), Group B averaged 23.3, 8.0, and 0.3 correct responses to the 1-component, 2-component and 3-component directions, respectively. (See Figure 2)

Four trials were required to reach criterion on the 1-component directions (trials 4-7). Following attainment of this criterion, the ability to respond correctly to all 3 sets of directions was measured (trials 8-9). Perfect responding to the 1-component directions was maintained, and the number of correct responses to the 2-component directions increased from an average of 8.0 during trials 1-3 to 19.0 during trials 8-9 Correct responses to the 3-component directions increased from an average of 0.3 in trials 1-3 to an average of 5.0 during trials 8-9.

As can be discerned from Figure 2, correct responses to the 2-component directions decreased initially in the second teaching phase, but criterion performance was reached after 19 trials (trials 10-28). Performance on all 3 sets of directions was measured after the attainment of criterion (trials 29-30). Perfect responding to the 1-component directions was maintained, but only 22 correct responses were made to the 2-component directions in each trial. Correct responding to the 3-component directions increased from an average of 0.3 in trials 1-3 to 5.0 in trials 8-9 to 5.5 in trials 29-30.

Correct responding to 3-component directions was taught during trials 31-44. Because no increase in correct responding was noted, tangible reinforcers were introduced in trial 40. The program was terminated after trial 44 since no indication of improvement was noted.

Discussion

The four students in Group A and the five students in Group B learned to follow both the 1- and 2-component directions. Only Group A learned to follow the 3-component directions. However, two students in Group B consistently performed the behaviors required in the 3-component directions, but did not perform them in sequence. Thus, the program was a failure with Group B in that it did not allow each student to reach the instructional objective.

The question now arises about what can be done to teach Group B to follow 3-component directions in sequence. In any direction following situation there are at least four major problem areas: A) hearing; B) "comprehending" what the direction refers to; C) maintaining a memory trace of what was said until the motor responses are complete; and D) having a sufficient incentive to perform the responses. Since Group B reached criterion in both the 1- and 2-component directions, it is obvious that they could hear what was said and "comprehend" what behaviors were required by the directions. The difficulty, therefore, may have been with the incentives used or with the students' ability to remember the directions until the required chain of responses could be performed. The effectiveness of the incentives used can be determined by holding the directions constant and manipulating the amount and quality of various consequences. Attempts can be made to resolve the memory trace issue by constructing a series of related tasks which, at first, require immediate 1-component responses. Gradually, however, both the time delay as well as the number of responses could be increased. This kind of "readiness training" might then generalize to more complex tasks.

Although the program failed to bring all students to the predetermined performance level, all students did demonstrate substantial improvement when their terminal performance was compared with their baseline performance. It should be noted, however, that these students had been enrolled in public school programs for an average of 7.4 years. If their initial inability to follow directions of 2 and 3 components can be assumed to represent their general ability to follow directions, it seems reasonable to infer that the teachers responsible for these students in the past have spent a considerable amount of time and energy either guiding the students through desired behaviors or doing for them what they might have been able to do for themselves. If this inference is valid, two conclusions logically follow: First, low functioning trainable students are capable of learning to follow simple directions. Second, specific training procedures demanding gradually ascending criterion performance levels should be used to teach trainable students to follow verbal directions as soon as they enter school. Indeed, we should make attempts to see that these skills are developed before the students enter school.

Finally, the issue of generalization must be faced. The rationale for the implementation of this program was that if the students were taught to follow directions in one situation, this ability would generalize to other similar situations. While we are not prepared to document generalizations to other classes or to the community, verbal reports of the teachers indicate that following teacher directions did generalize within the classroom.

References

Baer, D., Wolf, M. M., & Risley, T. Current dimensions of applied behavior analysis. Journal of Applied Behavior Analysis, 1968, 1, 91-97.

Brown, L., Bellamy, T., & Gadberry, E. A procedure for the development and measurement of rudimentary quantitative concepts in low functioning trainable students. Training School Bulletin, in press.

Brown, L., Shores, R. E., & Gadberry E. Use of a stimulus-fading procedure to teach retarded-emotionally disturbed students to discriminate mathematical operations. Unpublished paper, University of Wisconsin, 1970.

Dunn, L. M. Exceptional Children in the Schools. Holt, Rinehart and Winston, 1963.

Goldberg, I. & Rooke, M. Research and educational practices with mentally deficient children. In N. Haring and R. Schiefelbusch (Eds.), Methods in Special Education. McGraw-Hill, 1967.

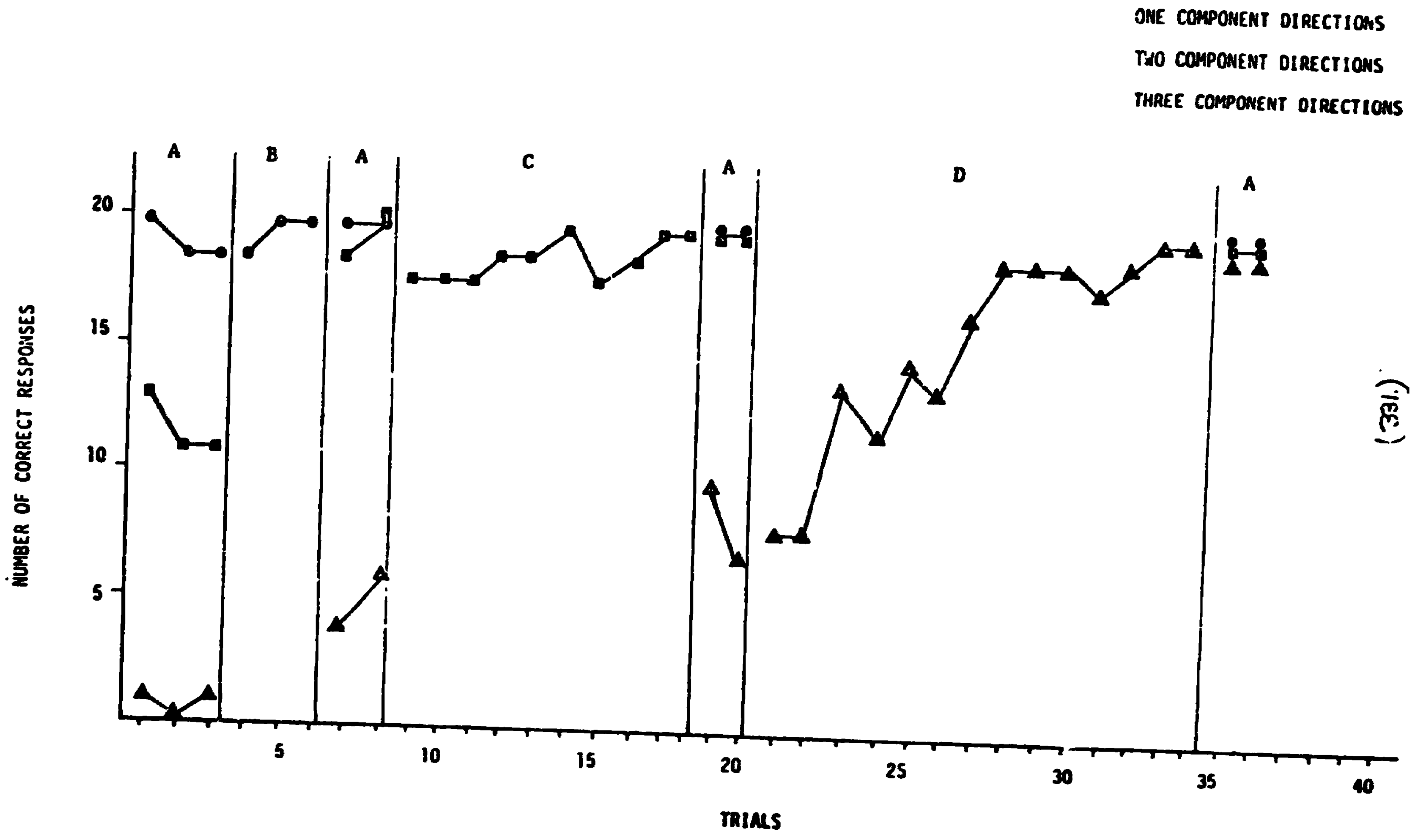
Risley, T. & Baer, D. Operant Conditioning: "Develop" is a transitive, active verb. In B. Caldwell and Ricciuti (Eds.), Review of Child Development Reseach Volume III: Social Influence and Social Action, in press.

Figures

Figure 1 - Number of correct responses made by Group A to verbal directions under baseline and teaching conditions: A) baseline B) teaching 1-component directions A) baseline C) teaching 2-component directions A) baseline D) teaching 3-component directions A) baseline.

Figure 2 - Number of correct responses made by Group B to verbal directions under baseline and teaching conditions: A) baseline B) teaching 1-component directions A) baseline C) teaching 2-component directions A) baseline D) teaching 3-component directions.

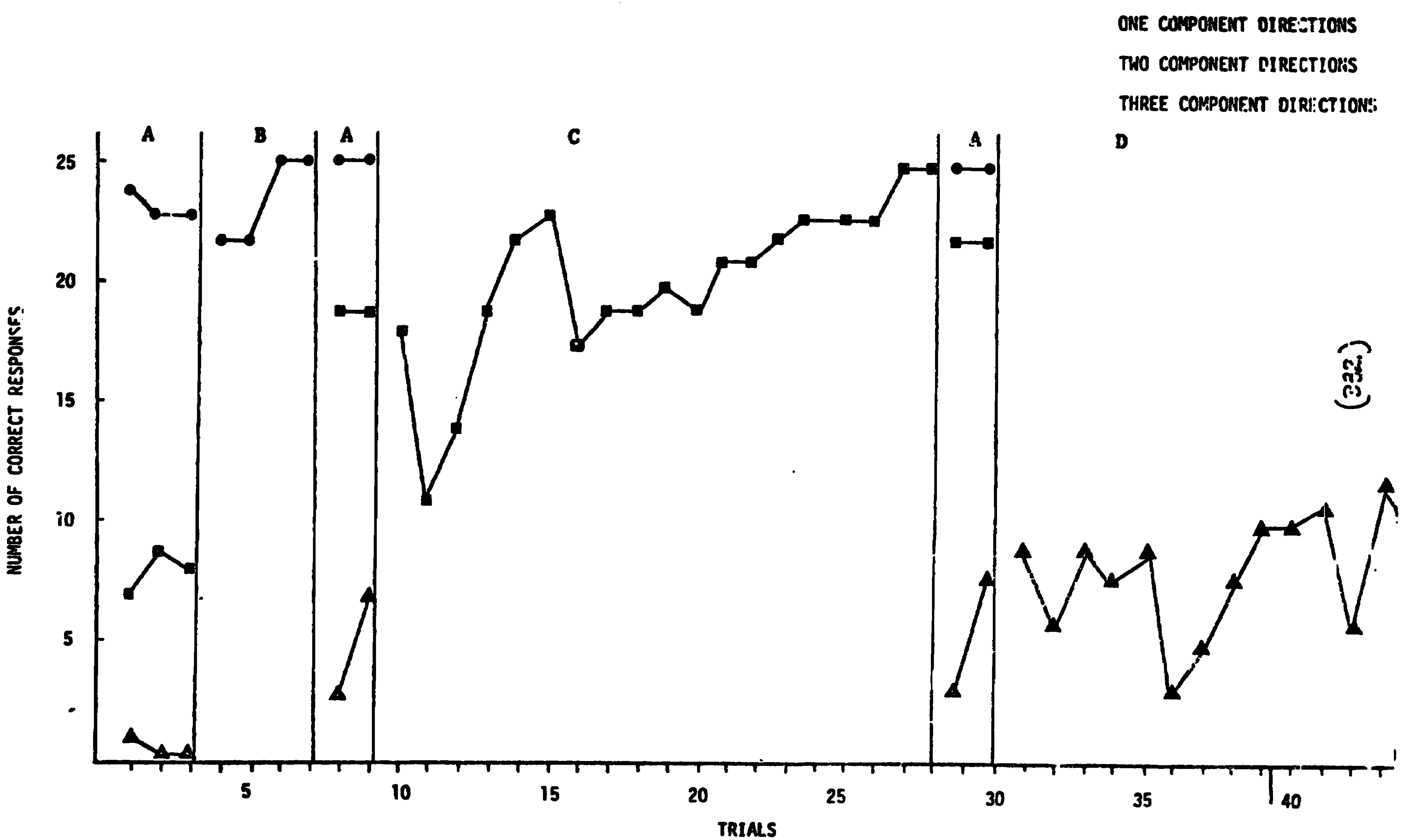
FIGURE 1



ONE COMPONENT DIRECTIONS
TWO COMPONENT DIRECTIONS
THREE COMPONENT DIRECTIONS
A
B
A
C
A
D
A
20
15
10
5
NUMBER OF CORRECT RESPONSES
5
10
15
20
25
30
35
40
TRIALS

(331.)

FIGURE 2


ONE COMPONENT DIRECTIONS
TWO COMPONENT DIRECTIONS
THREE COMPONENT DIRECTIONS
A
B
A
C
A
D
25
20
15
10
5
NUMBER OF CORRECT RESPONSES
5
10
15
20
25
30
35
40
TRIALS

Part V

DEVELOPMENT OF APPROPRIATE LEISURE SKILLS

Thus far we have reported programs that are designed to enable our students to maintain themselves in domestic, vocational and social environments. This part of the report will be devoted to our concern for the development of appropriate leisure skills.

The very thought that one person or an agency of the state should intervene into another person's life and attempt to systematically program specific behaviors that are expected to be performed at that person's leisure is a highly tenuous philosophical position. It is viewed that what one chooses to do with his free time is not the concern of the public schools. However, many of the students at Badger in the past and probably many students who will be involved with Badger in the future have had considerable difficulty functioning adaptively during leisure periods.

For example, several of our students seem to spend much of their after school hours eating. This behavior obviously has resulted in social, mobility and health problems. Other students have been reported to engage in many sterotyped self stimulatory behaviors (body rocking, hand twisting, top spinning etc.), wandering aimlessly, or simply seated in front of television sets for hours. These and many other such behaviors tend to be longitudinally maladaptive. That is, they tend to isolate the student from more effective kinds of interpersonal relationships. They are, in many ways, anti-developmental in that they interfere with the acquisition of new and more complex leisure behaviors, and may be potentially physically harmful.

Thus, it would appear that if a student does not have a realistic and developmentally sound leisure repertoire, an additional responsibility of those persons responsible for the development of these students is to provide for the development of leisure skills.

In no sense is it intended that these students are being programmed to perform arbitrarily sanctioned behaviors in their free time. On the contrary, our only intention is to enhance the individual freedom of the students through the development of behavioral options. That is, if a person can perform only two behaviors at a particular point in time he has but two choices. However, if 15 or 20 behaviors are available, freedom of choices increases substantially.

The following are examples of some of the skills that we will attempt to develop in the future.

1) Swimming
2) Boating
3) Community travel
4) Carpenting
5) Sewing
6) Crafts
7) Movie going
8) Shopping
9) Painting
10) Puzzle assembling
11) Model toy assembly
12) Fishing
13) Baseball
14) Football
15) Basketball
16) Tennis
17) Volleyball

Obviously, the public school system cannot assume the responsibility of teaching every student every behavior required in an adaptive leisure repertoire. However, it is becoming quite evident that the public school, because of the amount of time the students spend in the schools and the intensity and comprehensiveness of the involvment, is the major social agency responsible for their development. In addition, perhaps unlike most other students, trainable and severely emotionally disturbed students need a special kind of instructional expertise. For example, a maintenance man in his spare time can teach a group of normal students to play handball rather well. It is another matter, however, for the same concerned citizen to teach many of the students at Badger the same skills.

Thus, it is our view that it will be ultimately incumbent upon the public school staff to impart its instructional knowledge to recreators and other concerned persons in order to maximize success of the many community leisure programs available.

Part VI

DEVELOPMENT OF APPROPRIATE SOCIAL BEHAVIOR

When the issue of social behavior is discussed there are two usually oversimplified points of view that are almost always expressed. First, there are those who submit that effective social behaviors are the most crucial components of any worker's repertoire. If a person cannot get along with his work peers, is aggressive, etc. it is extremely unlikely that he will be able to function successfully in a vocational setting. Thus, it is argued the most important classes of behavior a public school can generate are those related to effective interpersonal relationships. Second, there are those who state that social behaviors are incompatible with appropriate vocational behaviors. That is, if a person is working efficiently, and if the incentives for work are sufficiently powerful, he does not have the time nor the inclination to aggress or otherwise act in a socially inappropriate way.

The Badger School staff recognizesthe potential validity of both points of view either singularly or in combinations.

For example, with several students we have encountered varying degrees of aggression, withdrawal, and indifference toward performing on work tasks. Through contingent reinforcement for appropriate behavior and the systematic manipulations of the school environment we have been able to demonstrate dramatic observable behavioral changes in desired directions. On the other hand, we have encountered students who have yet to respond as desired to a substantial number of manipulations that have been successful with their peers. In several of these situations the staff attempted to deal with the social problem directly, attempted to acquire the support of parents, requested help from psychological and psychiatric specialists, etc. Often times, however, even such sophisticated consultants have been to no avail.

From the aforementioned comments it should be obvious that the staff recognizes the inherent complexities of human behavior and the plethora of environmental events that might effect the response of a student at a given point in time. We are quite concerned with the absence of appropriate social behaviors in many of our students, and we are attempting to develop appropriate responses in almost every social situation we can control. Ultimately, we hope we will be able to neutralize antisocial behaviors through the development of educationally relevant incompatible responses. Where this approach fails we hope to be able to join with parents, other members of the public school and community agencies who are also concerned and in an attempt to develop social skills in students who do not respond to the environment generated in school.

To date, most of our data relevant to development of appropriate social skills is anecdotal. In the future, however, it is our intention to develop comprehensive and empirically verified socialization programs. Presumably, those programs will be reported in subsequent reports of the Badger School Curriculum.

PART VII

The Demands of the Future

It cannot be assumed that TMR and SED students learn incidentally, or observationally. If one adheres to the objective that these students will ultimately be prepared to function effectively in a community setting, it is quite logical that we must verify, through observation and direct teaching, the existence of a behavioral repertoire necessary for survival in such a setting. The nebulous and casual instructional procedures and the circumscribed curriculum content of the past are no longer relevant. A new, more sophisticated and more empirically based instructional technology, and a more creative, community oriented curriculum content are not only needed, but are absolutely necessary.

The remainder of this report therefore will be devoted to a brief delineation of the directions the Badger School program intends to take in the future.

<u>Technology</u>

Perhaps the most crucial problem confronting all programs for TMR and SED students is an empirically sound and verified instructional technology. Deciding what to teach these students and what materials to use etc. would be relatively simple if we know <u>how</u> to teach them. Instructional technology as it is used here refers to the specific rules of teaching that result in the student's acquisition of specific behaviors. Without improvements in the instructional technology available to teachers of these students, substantial changes in their ultimate life styles are extremely doubtful. Thus, the Badger staff will continue to develop instructional procedures that are, in fact, effective with TMR and SED students.

Instructional Content

In conjunction with the development of a functional instructional technology, more structured, practical and comprehensive instructional content must be developed. For example, each student must be taught to tell time, use money, exercise, read recipes, recognize foods, perform work tasks, groom himself, travel, and manage himself sexually.

Community Orientation

If the public school assumes the responsibility for developing community orientation skills, then massive changes in the structure and service of the delivery system in existence will be required. A trip to the zoo on a chartered bus and two trips "downtown" will not suffice. Many training trials over long periods of time are undoubtedly required to teach such skills as using public transportation, shopping, recreation, travel, safety, etc. If this instruction is undertaken, additional staff and money will be required. In addition, an arrangement of priorities within the curriculum will have to be undertaken. Currently it is the intention of the Badger staff to gradually introduce the teaching of community orientation skills into the Badger program. What form such an introduction will take is at this point unknown.

Vocational Training

Thus far the vocational component of the Badger program is quite circumscribed when one considers the number of jobs that appropriately trained students might be reasonably expected to perform upon completion of school. It is not unreasonable to assume that many of our students are capable of performing successfully in such jobs as housekeepers in hotels and motels, dish washers, car washers, maintainence men, delivery clerks, office clerks and college professors. It is the intention of the public school staff to attempt to plan for the realizations of such objectives in the future.

In addition, we intend to introduce our students to work-study programs, to teach more complex assembly tasks, to begin prevocational training at an earlier age, to provide more intensive training to more students on specific work tools, and to find ways to maintain high rates of accurate work behavior for sustained time periods.

Brown, L., & Perlmutter, L. Teaching Functional Reading to Trainable Level Retarded Students. Education and Training of the Mentally Retarded, 1971, 6, 74-84.

Brown, L., Jones, S., Troccolo, E., Heiser, C., & Bellamy, T. Teaching Functional Reading to Young Trainable Students: Toward Longitudinal Objectives. Submitted to Education and Training of the Mentally Retarded, January, 1971.

Brown, L., Bellamy, T., Bancroft, J., & Sontag, E. Development of Selected Pre-Reading Skills in Young Trainable Students. Submitted to Instructor, September, 1971.

Math

Brown, L., Bellamy, T., & Gadberry, E. A Procedure for the Development and Measurement of Rudimentary Quantitative Concepts in Low Functioning Trainable Students. Training School Bulletin, in press.

Brown, L., Bellamy, T., Gadberry, E., & Sontag, E. Teaching Addition to Young Trainable Students: A Sequential Procedure. Presented at State Convention of the Wisconsin Association of Retarded Children, Rhinelander Wisconsin, May, 1971.

Bellamy, T., & Brown, L. A Sequential Procedure for Teaching Addition Skills to Trainable Retarded Students. Submitted to Training School Bulletin, June, 1971.

Brown, L., Shores, R., & Gadberry, E. Use of a Stimulus-Fading Procedure to Teach Retarded-Emotionally Disturbed Students to Discriminate Mathematical Operations. Submitted to Education and Training of the Mentally Retarded, June, 1970.

Language

Brown, L., & Klemme, H. Teaching Trainable Level Retarded Children to Speak in Sentences. Unpublished paper, 1970.

Brown, L., Bellamy, T., Tang, P., & Klemme, H. A Procedure for Teaching Trainable Students to Follow Verbal Directions. Submitted to Journal for Special Educators, June, 1971.

PART VIII

LIST OF PAPERS INCLUDED IN THE REPORT

Workshop

Brown, L., & Pearce, E. Increasing the Production Rates of Trainable Retarded Students in a Public School Simulated Workshop. Education and Training of the Mentally Retarded, 1970, 5, 15-22.

Brown, L., Johnson, S., Gadberry, E., & Fenrick, N. Increasing Individual and Assembly Line Production Rates of Retarded Students. Training School Bulletin, 1971, 67, 206-212.

Brown, L., Van Deventer, P., & Perlmutter, L. Effects of Consequences on Production Rates of Trainable Retarded and Severely Emotionally Disturbed Students in a Public School Workshop. Submitted to Education and Training of the Mentally Retarded, February, 1971.

Brown, L., Bellamy, T., Perlmutter, L., Sackowitz, P. & Sontag, E. The Development of Quality, Quantity, and Durability in the Work Performance of Retarded Students in a Public School Prevocational Workshop. Submitted to Training School Bulletin, September, 1971.

Bellamy, T., & Sontag, E. Use of Group Contingent Music to Increase Assembly Line Production Rates of Retarded Students in a Simulated Sheltered Workshop. Submitted to American Journal of Mental Deficiency, August, 1971.

Reading

Brown, L., Klemme, H., Haubrich, P., & Ora, J. Individual and Group Instruction with Trainable Level Retarded Students. University of Wisconsin and George Peabody College, January, 1970.

Brown, L., Hermanson, J., & Ora, J. Teaching a "Trainable Level" Student Basic Sight Vocabulary. University of Wisconsin and George Peabody College, January, 1970.

Brown, L., Fenrick, N., & Klemme, Trainable Level Retarded Students Teach Trainable Level Retarded Students. Teaching Exceptional Children, in press. Presented at the International Convention of the American Association on Mental Deficiency, Houston, Texas, June, 1971.

PART VIII

LIST OF PAPERS INCLUDED IN THE REPORT

Workshop

Brown, L., & Pearce, E. Increasing the Production Rates of Trainable Retarded Students in a Public School Simulated Workshop. Education and Training of the Mentally Retarded, 1970, 5, 15-22.

Brown, L., Johnson, S., Gadberry, E., & Fenrick, N. Increasing Individual and Assembly Line Production Rates of Retarded Students. Training School Bulletin, 1971, 67, 206-212.

Brown, L., Van Deventer, P., & Perlmutter, L. Effects of Consequences on Production Rates of Trainable Retarded and Severely Emotionally Disturbed Students in a Public School Workshop. Submitted to Education and Training of the Mentally Retarded, February, 1971.

Brown, L., Bellamy, T., Perlmutter, L., Sackowitz, P., & Sontag, E. The Development of Quality, Quantity, and Durability in the Work Performance of Retarded Students in a Public School Prevocational Workshop. Submitted to Training School Bulletin, September, 1971.

Bellamy, T., & Sontag, E. Use of Group Contingent Music to Increase Assembly Line Production Rates of Retarded Students in a Simulated Sheltered Workshop. Submitted to American Journal of Mental Deficiency, August, 1971.

Reading

Brown, L., Klemme, H., Haubrich, P., & Ora, J. Individual and Group Instruction with Trainable Level Retarded Students. University of Wisconsin and George Peabody College, January, 1970.

Brown, L., Hermanson, J., & Ora, J. Teaching a "Trainable Level" Student Basic Sight Vocabulary. University of Wisconsin and George Peabody College, January, 1970.

Brown, L., Fenrick, N., & Klemme, H. Trainable Level Retarded Students Teach Trainable Level Retarded Students. Teaching Exceptional Children, in press. Presented at the International Convention of the American Association on Mental Deficiency, Houston, Texas, June, 1971.

Brown, L., & Perlmutter, L. Teaching Functional Reading to Trainable Level Retarded Students. Education and Training of the Mentally Retarded, 1971, 6, 74-84.

Brown, L., Jones, S., Troccolo, E., Heiser, C., & Bellamy, T. Teaching Functional Reading to Young Trainable Students: Toward Longitudinal Objectives. Submitted to Education and Training of the Mentally Retarded, January, 1971.

Brown, L., Bellamy, T., Bancroft, J., & Sontag, E. Development of Selected Pre-Reading Skills in Young Trainable Students. Submitted to Instructor, September, 1971.

Math

Brown, L., Bellamy, T., & Gadberry, E. A Procedure for the Development and Measurement of Rudimentary Quantitative Concepts in Low Functioning Trainable Students. Training School Bulletin, in press.

Brown, L., Bellamy, T., Gadberry, E., & Sontag, E. Teaching Addition to Young Trainable Students: A Sequential Procedure. Presented at State Convention of the Wisconsin Association of Retarded Children, Rhinelander, Wisconsin, May, 1971.

Bellamy, T., & Brown, L. A Sequential Procedure for Teaching Addition Skills to Trainable Retarded Students. Submitted to Training School Bulletin, June, 1971.

Brown, L., Shores, R., & Gadberry, E. Use of a Stimulus-Fading Procedure to Teach Retarded-Emotionally Disturbed Students to Discriminate Mathematical Operations. Submitted to Education and Training of the Mentally Retarded, June, 1970.

Language

Brown, L., & Klemme, H. Teaching Trainable Level Retarded Children to Speak in Sentences. Unpublished paper, 1970.

Brown, L., Bellamy, T., Tang, P., & Klemme, H. A Procedure for Teaching Trainable Students to Follow Verbal Directions. Submitted to Journal for Special Educators, June, 1971.