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## A Test as a Delayed Contingency for Acquiring Elementary Textual Behavior in a Classroom Setting for Trainable Retardates

Eugene A. Kaprowy  
*Western Michigan University*

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A TEST AS A DELAYED CONTINGENCY FOR  
ACQUIRING ELEMENTARY TEXTUAL BEHAVIOR IN A CLASSROOM  
SETTING FOR TRAINABLE RETARDATES

by

Eugene A. Kaprowy

A Thesis  
Submitted to the  
Faculty of The Graduate College  
in partial fulfillment  
of the  
Degree of Master of Arts

Western Michigan University  
Kalamazoo, Michigan  
December 1971

## ACKNOWLEDGEMENTS

I wish to express my gratitude to the members of my committee, Dr. Jack Michael, Mr. Charles Laufer, and Dr. Neil Kent for their cooperation and advice, and to Brian Jacobson who was a constant source of encouragement. I am especially indebted to Vicki Quitschau who played a critical role in the early development of the classroom project, and whose influence never ceased to be felt. I also greatly acknowledge the Fort Custer State Home for the use of the facilities, and the students from Western Michigan University and the Kalamazoo School District who collected the data for this research. Special thanks go to Ruth Reames and Althie St. Martin who expended considerable energies in motivating the experimenters and seeing to it that the experimental procedures ran smoothly.

Eugene A. Kaprowy

MASTERS THESIS

M-3192

KAPROWY, Eugene A.

A TEST AS A DELAYED CONTINGENCY FOR ACQUIRING  
ELEMENTARY TEXTUAL BEHAVIOR IN A CLASSROOM  
SETTING FOR TRAINABLE RETARDATES.

Western Michigan University, M.A., 1971  
Psychology, experimental

**University Microfilms, A XEROX Company, Ann Arbor, Michigan**

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## TABLE OF CONTENTS

CHAPTER		PAGE
I	INTRODUCTION . . . . .	1
II	THE GROUP TEACHING SYSTEM . . . . .	4
	The Setting . . . . .	4
	Programming for the Classroom . . . . .	6
	The Token System and Classroom Contingencies . . . . .	9
	Testing Procedures . . . . .	14
III	EXPERIMENTAL PROCEDURES . . . . .	16
	Introduction . . . . .	16
	Subjects . . . . .	17
	Phase One of Experiment . . . . .	19
	Phase Two of Experiment . . . . .	21
	Phase Three of Experiment . . . . .	25
IV	RESULTS . . . . .	29
	Harry . . . . .	29
	John . . . . .	31
	Jerry . . . . .	33
	Ruple . . . . .	35
	Ernie . . . . .	37
	Jimmy . . . . .	39
	Dale . . . . .	41
	Jamie . . . . .	41
	Dennis . . . . .	44
V	DISCUSSION . . . . .	47

# TABLE OF FIGURES

FIGURE		PAGE
1.	A diagram of the classroom setting in which the children were taught.....	5
2.	A representation of a Classroom Teaching Program.....	10
3.	A diagram of a flagboard .....	12
4.	A review of the Group Teaching System.....	15
5.	A review of the experimental procedures.....	18
6.	Harry's texting performance on tests following classroom instruction.....	30
7.	John's texting performance on tests following classroom instruction.....	32
8.	Jerry's texting performance on tests following classroom instruction.....	34
9.	Ruple's texting performance on tests following classroom instruction.....	36
10.	Ernie's texting performance on tests following classroom instruction.....	38
11.	Jimmy's texting performance on tests following classroom instruction.....	40
12.	Dale's texting performance on tests following classroom instruction.....	42
13.	Jamie's texting performance on tests following classroom instruction.....	43
14.	Dennis's texting performance on tests following classroom instruction.....	45

## CHAPTER I

### INTRODUCTION

Recent studies by MacAulay (1968); Sloane, Johnson, and Harris (1968); Risley and Wolf (1968); and others demonstrated clearly that children deficient in language development, such as the retarded, can be taught elementary verbal skills. A technology has emerged from these studies for proper sequencing of subject matter, effective stimulus management, and the arranging of powerful learning contingencies. However, this information has been designed to be used in educational settings where the student/experimenter ratio is low (usually 1:1). Because of the practical limitations of tutorial teaching systems, and the importance of verbal behavior in the social development of children, it seems desirable to develop a technology for teaching elementary verbal behavior on a group basis.

Keller (1968) has developed an educational system based on behavioral principles, as an alternative to the traditional lecture and final examination format in college education. His system includes careful sequencing of subject behavior and frequent testing to evaluate the developing repertoires of his students. In addition, interesting lectures, demonstrations, and discussions function as backup reinforcers for students who do well on their tests. As a result of these procedures he has been able to produce high quality behavioral changes in large groups of students. Keller's system arouses curiosity about application of testing procedures in the group education of the



retarded for several reasons. It manages to circumvent the use of "trial by trial" teaching programs as exemplified by devices such as teaching machines. In addition, his testing procedure seems to offer a solution in situations where it is impossible to consequence and monitor academic progress immediately.

On the basis of the above applications, an experimental group education system was developed to teach seventeen retarded children elementary verbal skills. The group teaching was conducted in a large room by one teacher with four or five aids. The children were exposed to a common set of teaching materials. Upon completion of their classroom work, they were administered daily tests over the materials to which they were exposed in the classroom. When the children finished their tests they were allowed access to a variety of backup reinforcers.

In the development of this system it was of paramount concern to provide the children with a group teaching program. In this program each child would be afforded the opportunity to learn programmed verbal material throughout an entire group teaching session--it was imperative that the classroom setting was not an extension of a "one-to-one" setting wherein each child could benefit from only a small portion of the teacher's time. To accomplish this goal, group trials were inserted into the classroom teaching programs and single trials were so arranged that each child was asked similar material. This solution provided each child with opportunities to learn while giving a teacher a program where each child was treated identically (thus simplifying her teaching task). It was impossible, however, for the teacher to manage stimuli effectively when teaching the children textual behavior. For

example, neither fading<sup>1</sup> nor conventional  $s^D-s^{\Delta 2}$  training could be utilized without compromising the objective of the project.

To overcome this difficulty the delayed testing contingency for performance in the classroom was incorporated into the group teaching system in two different testing procedures. One procedure consisted of reinforcing correct vocal responses with tokens and social praise, while ignoring wrong answers for a period of about ten seconds. The other procedure was similar except for the additional contingency that the children had to obtain a certain percentage of correct answers on their tests in order to gain access to the backup reinforcers. Under both conditions the children learned to read elementary vocal units equally well. As a result of this work, an experiment has been designed to investigate the function of the test as it appeared to be an integral part of the teaching system.

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<sup>1</sup>Fading is a procedure for transferring control of responding from one stimulus or set of stimuli to another by gradually altering the controlling stimuli until a completely or partially new set of stimuli are controlling the response. This procedure is widely used in behavior modification since error rates are low, the strength of responding is not diminished, and little emotional behavior is produced.

<sup>2</sup> $s^D-s^{\Delta}$  Training is a procedure used to develop stimulus control wherein a response is reinforced in the presence of one stimulus ( $s^D$  condition) and extinguished in the presence of other stimuli ( $s^{\Delta}$  condition).

## CHAPTER II

### THE GROUP TEACHING SYSTEM

#### The Setting

The group teaching procedures were carried out in a large room (22' x 19') which resembled a traditional grade-school classroom in several respects. At the "head" of the class was a large blackboard and a low table for the teacher. The children's desks were arranged around the teacher in a way that resembled three sides of a square. Placed on each child's desk was a data sheet and equipment for the token economy. Additional experimenters, called token dispensers, were positioned behind the children to record data and execute certain aspects of the token system. One person functioned as a token dispenser for every three or four children. A diagram of the classroom setting can be seen in figure 1.

Testing was conducted in individual cubicles. There were two cubicles at the rear of the classroom and eight more located nearby in the same building. Each cubicle contained a desk and chair for the child and a chair for the experimenter. Located on the desk was equipment for the token economy together with the experimenter's data sheet. The stimulus materials over which the children were tested were displayed on flash cards which were pinned to the wall facing the child. Typically a child was never more than three or four feet away from the flash cards.

Because the project was designed as a comprehensive educational

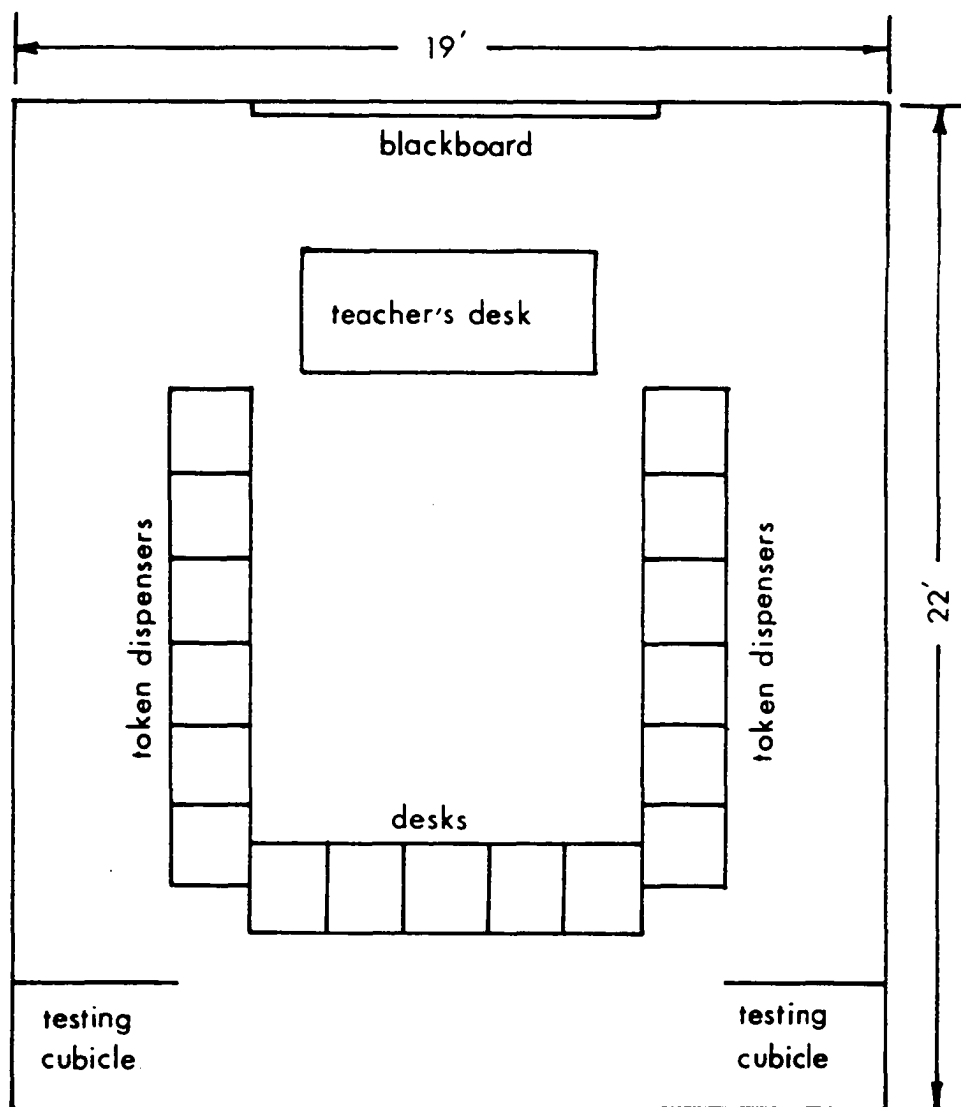


Figure 1. A diagram of the classroom setting in which the children were taught.

effort, high probability activities were programmed as backup reinforcers. Food was available only at the end of the entire session. When the weather was appropriate the children were allowed outdoors where they were free to engage in a wide variety of activities. However, social behavior was encouraged through such activities as ball playing, swimming in a plastic wading pool, and taking each other for wagon rides. During inclement weather a toyroom was available for the children's use. This room was divided into several sections and the children were free to wander from section to section. The following activities proved to be particularly reinforcing: finger painting, scribbling on a blackboard, looking at magazines and books, dancing with the experimenters, and "gym activities" in a section where there was a tumbling mat, a trapeze and a tunnel. Aids were always present to reinforce appropriate behavior and interact with the children. In addition, contemporary music was played over a P.A. system.

### Programming For The Classroom

#### The sequential programming of elementary verbal behavior

Traditional programming of verbal behavior developed to teach children how to echo<sup>1</sup>, text<sup>2</sup>, and tact<sup>3</sup> utilized a 1:1 setting. In

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<sup>1</sup>Echoic Behavior is a type of verbal functional relationship wherein the response is vocal and the controlling stimulus is auditory. In addition, there is point to point correspondence between properties of the auditory stimulus and the vocal response. This feature makes a repertoire of minimal units feasible (for purposes of this study the minimal units were defined by the phonemes of the I.T.A.).

order to accomplish the project goals of group education, this program relied less on individual histories, and techniques such as fading and conventional  $s^D - s^\Delta$  training were not used.

Upon entering the project all the children were given extensive imitative training using simple motor responses in one and two unit chains. When the children imitated a variety of motor responses on a group and single basis, echoic training began in conjunction with the motor imitation. Five minimal vocal units were chosen from the Initial Teaching Alphabet (I.T.A.).<sup>4</sup> When these vocal responses came under echoic control, textual training began while the imitation and echoic training continued. When these five vocal units were under textual control, new minimal vocal units were introduced into the above system, three at a time. Only ten sounds were covered on a given teaching program, but old (learned) textual items appeared on the children's tests.

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<sup>2</sup>Textual Behavior is a type of verbal functional relationship wherein the response is vocal and the controlling stimulus is written. Point to point correspondence exists between the stimulus and response making it possible to develop a repertoire of minimal units.

<sup>3</sup>Tacting Behavior The tact is a verbal functional relationship wherein the stimulus is usually nonverbal while the response can be vocal, written, or in the form of gestures. Stimulus control is emphasized by way of generalized reinforcement and all properties of the stimulus come to control the response. A common example of tacting behavior is "object naming".

<sup>4</sup>I.T.A. (The Initial Teaching Alphabet) I.T.A. is a phonemic alphabet developed by Lord Pitman (1900). Forty phonemes are used, while forty-four symbols are used to represent the phonemes (four phonemes have two symbols). The alphabet is advantageous in work with trainable retardates in that the phonemic divisions are distinct and the I.T.A. symbols closely resemble the symbols used in traditional orthography.

In this project, progress goals were not set past texting minimal vocal units. (The strategy for the future, however, will be to teach the children to say words by chaining the minimal textual units to produce larger functional units. A pointer will be used to control the children's rate of reading in order to accomplish sound blending. When the children are able to read words, then they will be taught the corresponding objects in their environment.)

#### The classroom teaching program

The teaching program was a form of group teaching. That is to say, each child was exposed to similar stimulus materials, and for a given session each child had an equal number of opportunities in order to respond for the purpose of gaining reinforcement. The behaviors that the children were to acquire and the control over those behaviors were specified by trials. Different kinds of trials were labeled in the following manner: 1. If all the children were required to respond simultaneously to a teacher's stimulus presentation the trial was called a group trial. 2. When only one child was required to respond at a time it was called a single trial. 3. In addition, trials were labeled according to the verbal functional relationship being taught. For example, if all the children were required to respond to an echoic stimulus, the trial was labeled a group echoic trial. If one child was required to emit a textual response, the trial was called a single texting trial. In addition, imitative behavior (motor imitations) were always included, usually in the form of group trials.

To form a teaching program, trials were then arranged in

sequences. For a given sequence only one vocal unit of a given topology was required. Therefore a sequence required that the children emit one vocal unit under various forms of stimulus control. For example, if the vocal response "m" was to be taught, a sequence might be as follows: a group imitative trial, followed by a group echoic trial, followed by a series of single echoic trials, followed by a group texting trial, and climaxed by a series of single texting trials. Then a new sequence of similar format commenced, using a new vocal unit. When there were seventeen children in the classroom, ten similar sequences, each composed of five different kinds of trials were used. Therefore each child had 50 opportunities to respond during a session. With a program of this type, wherein the teacher delivered about 350 trials, a session lasted from 45 - 60 minutes. This program was graphically presented on paper, and in so doing, it functioned as a data sheet for each child. An example of a typical classroom teaching program can be seen in figure 2. (For further information concerning the classroom teaching program see "Classroom procedures" for phase two of the experiment.)

### The Token System And Classroom Contingencies

#### The flagboard and receiving token reinforcement

Located on each child's desk was a flagboard. This was a piece of styrofoam (15" x 9") covered by glossy cream-colored paper, which was divided into two sections; the "bank" and "criterion" sections. Both sections had an equal number of colored dots on them. In the "bank"



Sequence	Group Imitation Trial	Group Echoic Trial	Single Echoic Trial	Group Texting Trial	Single Texting Trial
1	CLAP HANDS 1	r 2	r 3	r 4	r 5
2	BANG CHEST 6	p 7	p 8	p 9	p 10
3	TOUCH NOSE 11	ai 12	ai 13	ai 14	ai 15
4	TAP TABLE 16	Z 17	Z 18	Z 19	Z 20
5	RAISE ARMS 21	(e) 22	(e) 23	(e) 24	(e) 25
6	SPREAD ARMS 26	ue 27	ue 28	ue 29	ue 30
7	BREATHE DEEPLY 31	g 32	g 33	g 34	g 35
8	TOUCH HEAD 36	t 37	t 38	t 39	t 40
9	OPEN MOUTH 41	ʃ 42	ʃ 43	ʃ 44	ʃ 45
10	TOUCH EAR 46	æ 47	æ 48	æ 49	æ 50

Figure 2. A representation of a Classroom Teaching Program. This program functioned as a teaching program for the teacher and as a data sheet for the teacher aids.

section, however, there was a flag<sup>1</sup> piercing each dot. Each child's flagboard was similar except for the number of dots on the board. A diagram of a flagboard can be seen in figure 3.

When a child emitted a correct response, either during a group trial or a series of single trials, his token dispenser placed a red block on his desk. When the series of single trials was completed (approximately 1.5 minutes) or on completion of a group trial the teacher said, "Class, if you have a block, take a flag." If a child had earned a red block, he took a flag from the "bank" section and placed it on the "criterion" section of the flagboard. While the child was taking a flag, his token dispenser took back the red block, and filled in the child's data sheet. When a child had his flagboard filled in, he was allowed to leave the class to take his test.

Red blocks were used as an intermediary step between academic responding and flag reinforcement for several reasons. The use of red blocks allowed the teacher to consequence the children on a group basis. The importance of the group consequence with respect to the motivational system is unclear. It did, however, reduce the time that the teacher spent delivering flag reinforcement. In addition, it was considerably easier to monitor the flag-taking activity since all the children were taking flags at the same time. Another reason for the use of the red blocks was that the blocks on the children's desks functioned to tell the teacher who had, and who had not been called on

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<sup>1</sup>A flag was a thumbtack covered by "mystic tape" in such a way as to form a handle.

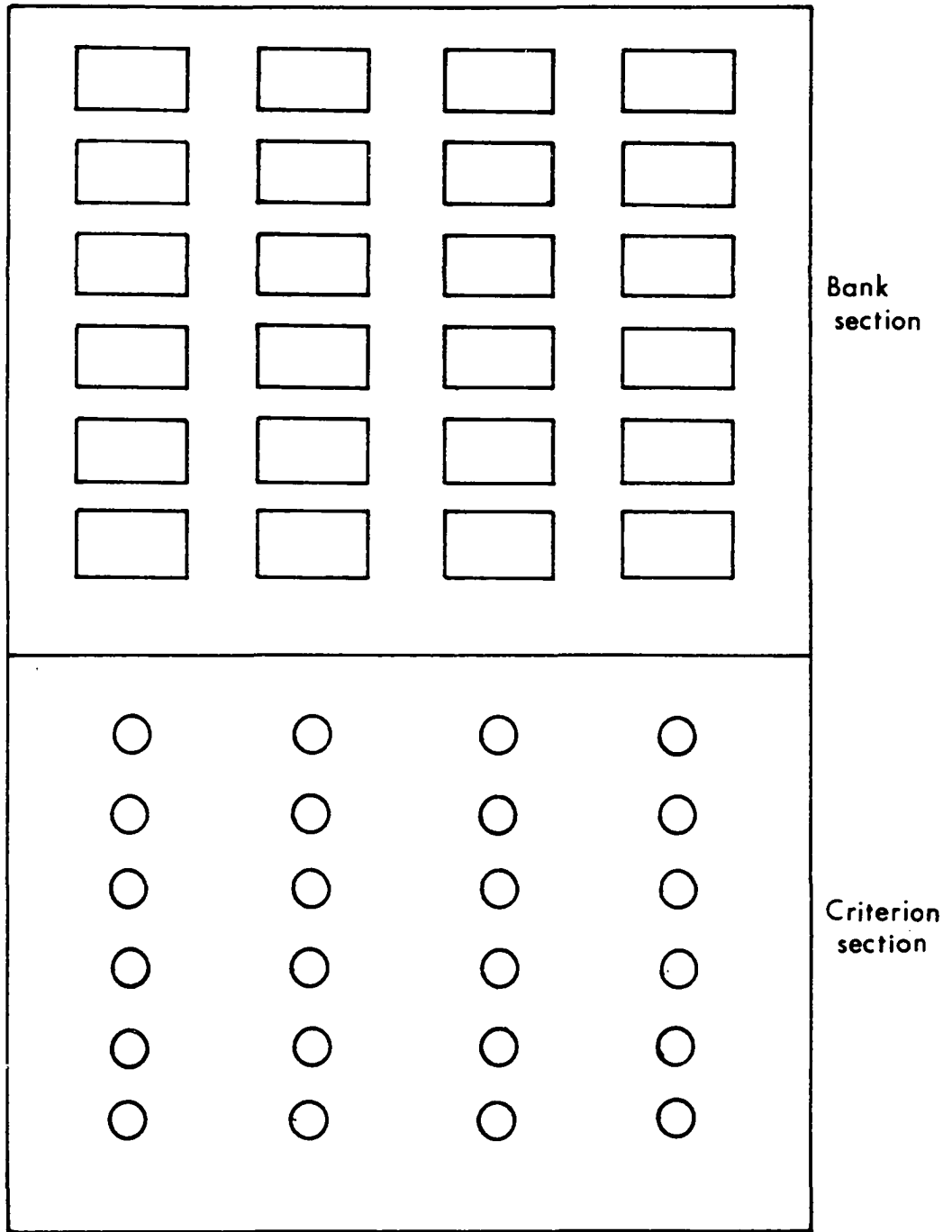


Figure 3. A diagram of a flagboard which was part of the Token System used in the Group Education System.

during a series of single trials. This was an important factor with such a large group of children.

#### Setting flagboard criteria

The teaching programs and backup reinforcers were common to the group, but the "economics" of the flag system was tailored for each child. That is to say, each child was required to earn a certain number of flags, based on his previous performance, in order to leave the classroom. Criteria (the number of flags that each child had to obtain in order to leave the classroom) were set by looking at the data for each child on the previous session. This was possible because a teaching program was used for about twelve sessions.

When a new fifty-trial-classroom program was introduced, a child's beginning criterion was usually set at thirty. As a child's performance improved, his criteria rose accordingly. The unit, forty, was typically the highest criterion which allowed deserving children to leave the classroom early. If a child did not meet his criterion on completion of the teaching program, he was required to remain in the classroom until the other children were ready to return to the ward (30 - 45 minutes). Children missed their criteria only when they were engaging in incompatable classroom behaviors, and it was found that their classroom performance improved considerably on the next session.

Children usually mastered the program in the classroom before their test results indicated that they indeed knew the material. The teaching program was continued, however, until their performance on the tests was adequate. Material that was particularly difficult for

several of the children was included as review material on the next teaching program.

### Testing Procedures

Refer to phase three of the experiment, following. In addition, a review of the Group Teaching System can be seen in figure 4.

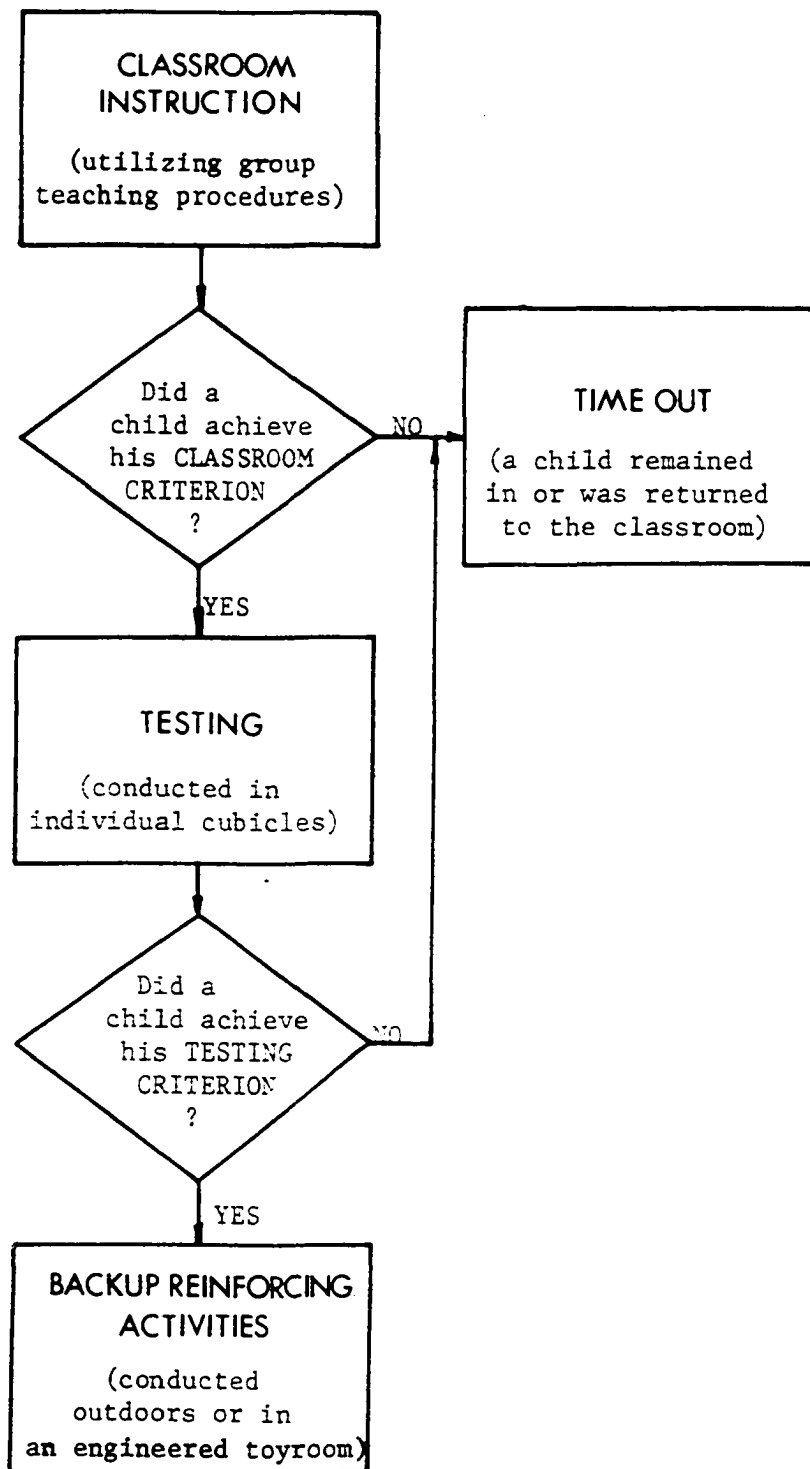


Figure 4. A review of the Group Teaching System.

## CHAPTER III

### EXPERIMENTAL PROCEDURES

#### Introduction

The purpose of the experiment was to determine if a "delayed contingency" in the form of a test was functional in increasing the effectiveness of the classroom program to teach trainable retardates elementary verbal skills. The dependent variable which was studied was the children's performance on a test that was administered to each child individually following the completion of the classroom teaching program. The measure of the dependent variable was the percentage of correct items on each test that was administered. The independent variable which was manipulated was the set of contingencies controlling responding during the testing procedures. During the baseline condition of the experiment the test was such that the children merely had to emit vocal behavior in order to receive reinforcement. That is to say, vocal responses with correct topographies were not necessary requirements for reinforcement. The experimental manipulation was intended to change the testing conditions so that it was then necessary for the children to emit vocal responses with correct topographies in order to receive reinforcement.

The experimental procedures were divided into three phases. Phase one was designed to determine if a test with contingencies which did not include response topographies would function as a reliable dependent variable. That is to say, "Would the children emit correct

textual responses under testing conditions where it was not necessary for them to emit correct responses in order to receive reinforcement?" The second phase was the baseline condition of the experiment. This involved the introduction of classroom procedures (procedures other than those previously described) which were intended to determine if the contingencies incorporated in this classroom teaching program were sufficient to produce new textual behavior. Phase three involved altering the contingencies controlling responding during the testing procedures for those children who did not acquire the new textual material in phase two. The contingencies were so arranged that it was necessary for the children to emit correct textual responses in order to receive reinforcement. The following discussion includes a more complete description of the experimental phases. In addition, a table summarizing the experimental procedures can be seen in figure 5.

### Subjects

The children comprising this experiment were ten male trainable retardates who resided on the same ward at the Fort Custer State Home in Augusta, Michigan. They were selected from a group of seventeen children who had been exposed to the group teaching system for four months prior to the onset of this experiment. These ten children were selected because their classroom performance was consistent, and they could echo the vocal units which they would be required to text during the experimental procedures. They ranged in age from 9 - 14 years, and their I.Q.'s varied from untestable to approximately 50.



	Phase I	Phase II	Phase III
CLASSROOM PROCEDURES	A classroom teaching program was NOT used.	A classroom teaching program was used.	A classroom teaching program was used.
TESTING PROCEDURES	"WEAK TEST"  (Correct response topog- raphy was NOT a requirement for reinforcement.)	"WEAK TEST"  (The same test as was used in phase one was employed.)	"STRONG TEST"  (Correct response topography was a requirement for either the red or green group of items.)

Figure 5. A review of the experimental procedures.

## Phase One Of Experiment

### Overview

The children were exposed to a testing procedure which did not require that they emit correct textual responses in order to receive backup reinforcement. In addition, the children were not exposed to a classroom teaching program before they were tested.

### Purpose

The purpose of this phase was to determine if the children would emit correct textual responses under testing conditions where correct responses were not a necessary requirement for reinforcement. It was essential that the children emit correct responses if they were in their repertoires, since test performance was the dependent variable being measured. Learned items served as probes to evaluate the efficacy of the testing contingencies.

### Classroom procedures

No classroom teaching program was undertaken during phase one.

### Testing procedures

Twelve I.T.A. characters were selected which the ten children in the classroom could echo, but not text. In addition, six characters, the probes, were selected which the ten children could text consistently. This evaluation process was carried out in a "one-to-one" setting under

conditions wherein each child was required simply to emit vocal behavior in order to receive reinforcement.

When it was determined which items would appear on the children's tests the eighteen items were divided into two groups. One group consisted of six of the twelve new I.T.A. characters and the six learned I.T.A. characters (probes). These items were printed in green and appeared on the left side of the wall of each testing booth. The other group consisted of the remainder of the new I.T.A. characters (six) and the same six learned I.T.A. characters (probes). This group appeared in red and was placed on the right hand side of the wall of each booth. Each item was asked three times, and as a result each child had 72 opportunities to earn flags on the test.

The procedure that was used to ask the children each item on the test was identical to that used during the original testing procedures. When a child was sitting with his hands folded on his desk and looking at his tester, the tester pointed to an item on the wall. When it was clear that the child was looking at the item, the tester would say, "Do this.", thereby setting the occasion for the child to emit vocal behavior. The selection of items to be asked was accomplished in the following manner. Two items were asked from the green group; a probe, and then a new I.T.A. character. Two items were then asked from the red group; a probe followed by a new I.T.A. character. This pattern continued, with the experimenter randomly selecting items from each of the four sub-groups until the 72 items on the test were solicited.

Vocal responses to all items in both groups were reinforced regardless of the topographies of the vocal responses. The reinforcement

consisted of the experimenter giving the child social praise, and allowing the child to take a flag. In the event that the command, "Do this.", and/or the textual stimuli did not evoke vocal behavior within about five seconds of their presentation, the experimenters did one of two things. When it appeared that the child was afraid to emit a wrong response, the child was quickly asked an item which would evoke vocal behavior. When, however, it appeared that the child was disinterested, the experimenter would wait for approximately twenty seconds for a vocal response. If at the end of this time the child did not emit vocal behavior, the experimenter proceeded to another item. When the children completed their tests, they were allowed to engage in the backup reinforcing activities. These procedures have been outlined previously.

### Phase Two Of Experiment

#### Overview

The children continued to be exposed to the same testing procedure as in phase one. In addition, a teaching program was undertaken in the classroom setting before the tests were administered.

#### Purpose

The purpose of this phase was to determine if the classroom teaching program coupled with the "weak" test were sufficient to have the children acquire the new textual material. For the children who did not acquire the new material, this phase functioned as the baseline condition against which the performance on phase three would be

evaluated.

### Revised classroom procedures

The children were exposed to a revised classroom teaching program before they were administered their tests. This program was designed to allow each child the opportunity to gain reinforcement without the necessity of emitting textual behavior in the classroom. That is, there were no "imposed" contingencies for texting in the classroom teaching program. (In the original classroom teaching programs, there were textual trials incorporated into each sequence of trials. It was felt, however, that the contingencies for textual behavior which these trials represented were of dubious value.)

The following classroom teaching program was constructed to meet the above requirements. The first trial in a sequence was a group imitation. The second trial was a series of single trials which were a combination of the previous echoic and textual trials and called a text-echoic trial. The last trial in a sequence was a repeat of the second; another series of single-text, echoic trials. Since there were twelve new vocal units on the test, there were twelve sequences on the teaching program. Each child, therefore, had 36 opportunities to earn flags during the classroom session which lasted from 30 - 45 minutes.

The texts were printed on 8½" x 11" paper and covered by clear plastic film. They were placed on the blackboard in the same fashion as they appeared on the tests. The green group was on the left and consisted of the six new I.T.A. characters in the green group and the

six probes. The red group was on the right and it consisted of the six new I.T.A. characters in the red group and the six probes. The positioning of items within a group was presented in random fashion to insure that there was no correspondence between the position of items within groups in the classroom and those in the testing booths. In addition, there was no relationship between the position of items on the board and the order of their presentation from the teaching program. However, the teaching program was designed in such a way that the presentation of items from both groups was alternated. For example, one item was asked from the red group, and then a second was asked from the green group. Finally, the placement of the items on the board remained constant throughout the experiment, as did the order of their presentation from the teaching program.

The exact procedures used to administer the single-text, echoic trials will now be described. While the children were taking flags after completing a group imitation, the teacher stood up and pointed to the appropriate text on the board with a ruler. As the children returned their hands to their desks, the teacher called on one child at a time. "Calling on a child" was made contingent on the child sitting quietly, but it was not necessary that the child was looking at the teacher before he was called on. The teacher then said, "Do this.", and named the item that was being pointed to, while continuing to attend to the child. At no time during this interaction did the teacher look towards the board, or attempt to induce the child to look at the appropriate text. Consequently, the child merely had to echo the teacher's auditory stimulus, without looking at the teacher or the text on the

board, in order to receive reinforcement. If the topography of the child's vocal response was appropriate, the teacher said, "Good boy.", and the child's token dispenser placed a red block on the child's desk. If the response was wrong; that is, if the topography of the response closely resembled the topography of another vocal unit that had been undertaken, the teacher quickly went on to another child. If, however, the response was an approximation of the correct one, the teacher could spend up to thirty seconds trying to evoke a closer approximation of the correct sound. After this another child was asked to emit the same response under the above conditions. When all of the children who were sitting quietly had been called on; that is, when the series of single-text, echoic trials had been completed, the teacher removed the ruler from the board. Then the children who had blocks on their desks were allowed to take a flag.

There was also a change made in the flag system used in the classroom. In the original classroom procedures the children were given classroom criteria. Each child had to earn a certain number of flags in order to leave the classroom setting. For experimental purposes it was decided to eliminate classroom criteria so that each child would be required to complete the classroom teaching program before he was allowed to leave. Each child, therefore, had a flagboard with 36 flags. The children with the greatest number of flags at the end of the teaching program were allowed to leave first.

### Testing procedures

The testing procedures were the same as those used in phase one

of the experiment. Each group of items was treated identically, and vocal responses were reinforced, regardless of the topographies of the vocal responses.

### Phase Three Of Experiment

#### Overview

The children continued to be exposed to the same classroom teaching program as in phase two of the experiment. In addition, more stringent contingencies were imposed on their test performance for the new texts in either the red or green group. For items in one of these groups, vocal responses with correct topographies were a necessary requirement for reinforcement.

#### Purpose

The purpose of this manipulation of variables was to determine whether or not the test with contingencies for vocal responses with correct topographies would function to increase the effectiveness of the classroom teaching program for those children who failed to learn the material during phase two. That is to say, "Would the new testing procedure increase the probability of those children responding to the textual stimuli on the blackboard, rather than the teacher's echoic stimuli?"

#### Classroom procedures

The classroom procedures were identical to those used during



phase two of the experimental procedures. The children were exposed to a classroom teaching program where there were no "imposed" contingencies for the children to respond to the items on the blackboard.

### Testing procedures

There were 18 different vocal units which appeared on each child's test, twelve new I.T.A. characters and six probes. These texts were divided into two color groups, a red group and a green group. The green group was composed of six of the twelve new I.T.A. characters and the six probes. The red group was composed of the remaining six new I.T.A. characters and the six probes which also appeared in the red group. There were therefore, 24 items on each test. Since each item was asked three times, there were 72 trials comprising a test. In this phase of the experiment, revised testing contingencies were applied to performance on the new items in either the red or green group. This experimental sub-group of items varied from child to child as the group that was chosen was the one on which a child's performance was poorer during phase two of the experimental procedures.

The following discussion describes the revised testing contingencies that applied only to the experimental sub-group of new I.T.A. characters. If a child emitted a correct textual response, the examiner administered social praise and allowed the child to take a flag. If a child emitted a wrong response, the examiner said, "No, that's wrong.", and the child was ignored for as long as it took the tester to fill in the child's data sheet. Responses were considered incorrect if the topographies of the vocal response did not closely approximate

the quality of the child's vocal behavior in the classroom setting. In addition, a response was considered incorrect if a child did not emit the appropriate vocal response within about 20 seconds of the tester's stimulus presentation.

A criterion system was also used. The children were required to emit an increasing number of correct responses to items in the experimental sub-group in order to gain access to the backup reinforcers. If a child did not meet his criterion for a given session, he was returned to the classroom to wait for the other children to complete the backup reinforcing activities. It might be emphasized that passing or failing a test was based solely on performance for the new items in the experimental sub-group. The remaining eighteen items on the test were treated in exactly the same fashion as in phase one and two of the experimental procedures.

When phase three began, a child was required to emit one more correct response than was emitted on the last session of phase two. When this initial criterion was met, the child's next criterion was raised by one. Therefore, the children were required to emit one more correct response on their next test than they emitted on the last test on which criterion was met or surpassed. The following example should make the criterion contingencies clearer. If a child had a criterion of ten during session 30, but he emitted eleven correct responses on that test, then his criterion on the following test was raised to twelve. If on test 31, however, he emitted only nine correct responses, his criterion for session 32 remained at twelve. His criterion continued to remain at twelve until he met or surpassed this level, at which time

his next criterion was one higher than the total number of correct responses emitted on that test.

## CHAPTER IV

### RESULTS

The individual data for 9 of the 10 children in the experiment have been presented in figures 6 - 14. The datum for one child was omitted because of alterations in the experimental procedure. A data point for I.T.A. characters in both the criterion and non-criterion groups, represents a mean percent correct score computed from 18 observations. A data point for the probes was computed from 36 observations. (The performance for the probes in both the red and green groups has been compiled in one data point). The phase three contingencies were imposed on only four of the children during session 27 of the experiment. This change has been indicated by a solid vertical line for those children and a dotted line for the other children. On the following session the phase three contingencies were imposed on Jerry, Jimmy and Ruple, while they were imposed on Dale on session 40 of the experiment, inasmuch as he was absent from sessions 18 - 27. The phase three contingencies were not imposed on Harry or John as they clearly had acquired the new textual material during phase two.

#### Harry

The data for Harry can be seen in figure 6. His performance on the probes during phase one was consistently at 100%. While he was in the process of learning the new I.T.A. characters in the early part of phase two, his performance on the probes fluctuated somewhat. However,

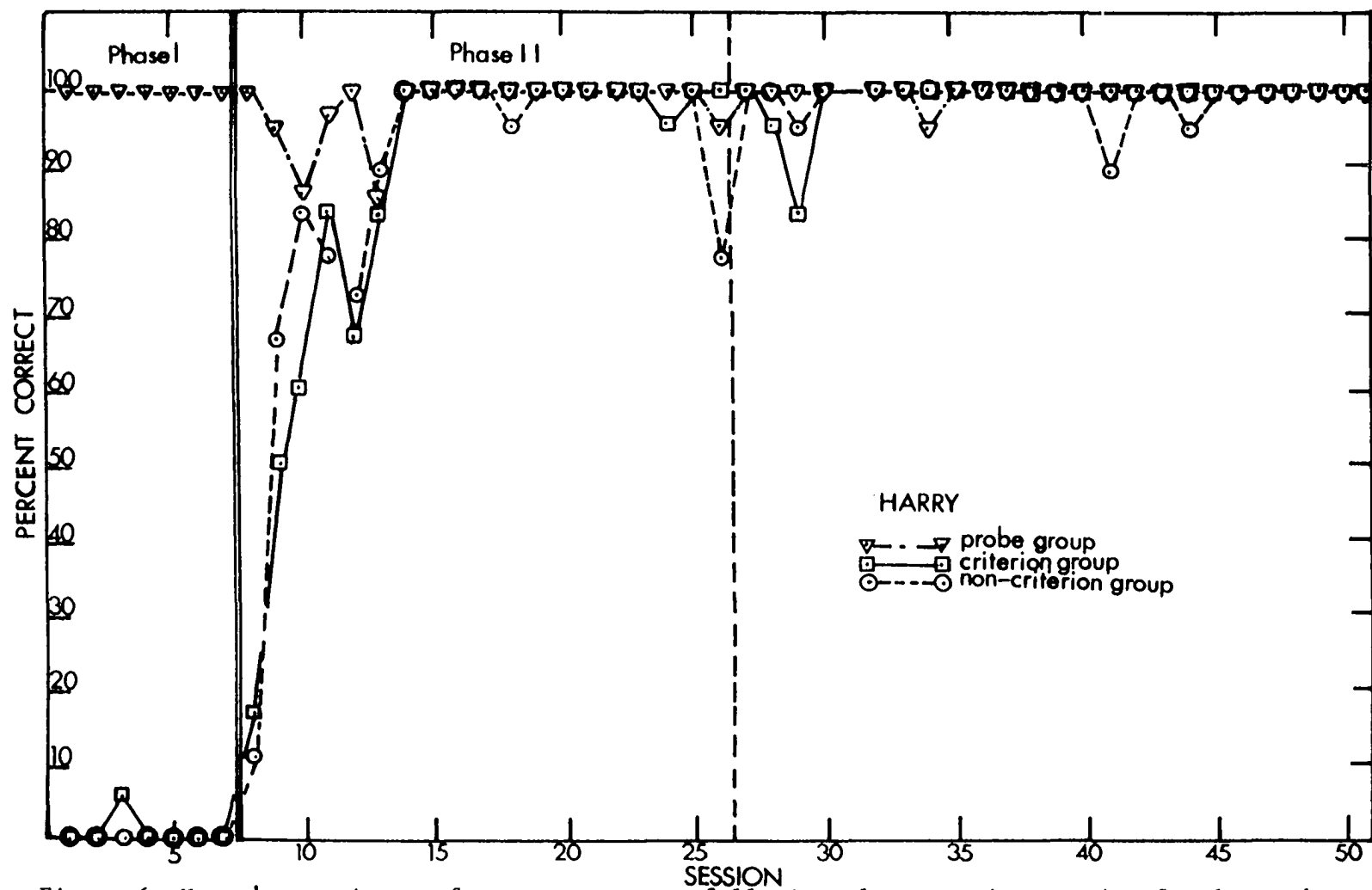


Figure 6. Harry's texting performance on tests following classroom instruction for learned items (probe group) and new items (criterion and non-criterion groups).

these errors were not of a predictable variety, as he would get different items wrong each time he was tested. His performance on all the new characters reached the 100% level on session 7 of phase two. At this time his performance on the probes also returned to 100%. Thereafter, his performance on the probes and new texts remained at a consistently high level.

It is of interest to note that Harry never presented a behavioral problem in the classroom, but he appeared indifferent to what was going on. During his tests he took an inordinate amount of time to respond to items, always appearing to be thinking intently. This long latency between stimulus presentation and vocal responding was a consistent phenomenon for him throughout the entire experiment. While Harry was learning the new material, his test performance was predictable in the sense that items were typically correct all three times they were asked and they remained correct on future sessions.

#### John

The data for John can be seen in figure 7. His performance on the probes fluctuated throughout the experiment. It ranged from a high of 100% to a low of 64%. It was not the case that his errors were consistent; rather they were unpredictable, changing from session to session.

During phase one John knew one item in each group of new I.T.A. characters. In phase two he learned the new textual material, but again, his performance was never free from errors. When John was learning the new material he did not learn one or two items at a time and

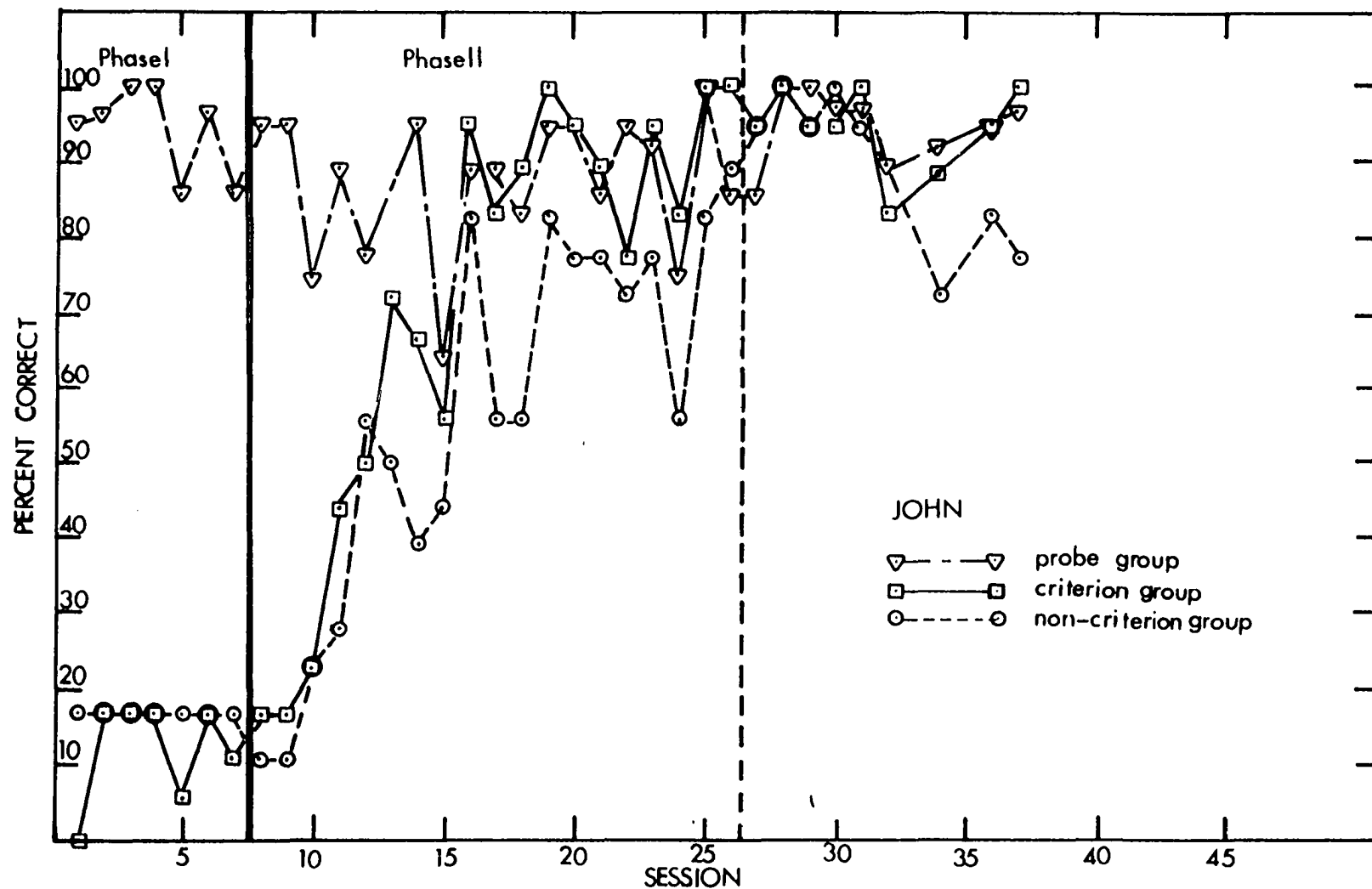


Figure 7. John's texting performance on tests following classroom instruction for learned items (probe group) and new items (criterion and non-criterion groups).

then add to his repertoire on subsequent sessions. Rather, he would get one of each of several items right and then improve on this performance on future sessions.

### Jerry

The data for Jerry can be seen in figure 8. His performance on the probes was at a high level during phase one of the experiment although his articulation for the "sh" and "zzz" sounds was poor. His examiners had difficulty in discriminating between the two sounds. In the early part of phase two his performance on the probes fluctuated somewhat. Here, the errors he incurred might be described as "careless" errors. On session 8 of phase two, however, he failed with the items for "sh" and "zzz" because of poor articulation. Thereafter, these items were incorrect because he substituted a new sound for both items. For the remainder of the experiment his performance on the probes was consistent at about the 56% level, except for some fluctuation during phase three.

His performance on the new texts was at the 0% level for most of phase one. During phase two he improved at a rate not unlike John's for the first four sessions. He then stabilized for five sessions and improved during the remainder of phase two. Often, he would seem to have learned one item for several sessions and then failed it on subsequent sessions. When the phase three contingencies were imposed on his behavior, this oscillating pattern continued. Unfortunately, he left for summer holidays after session 37 of the experiment. Of interest is the fact that during phase one and the first half of phase



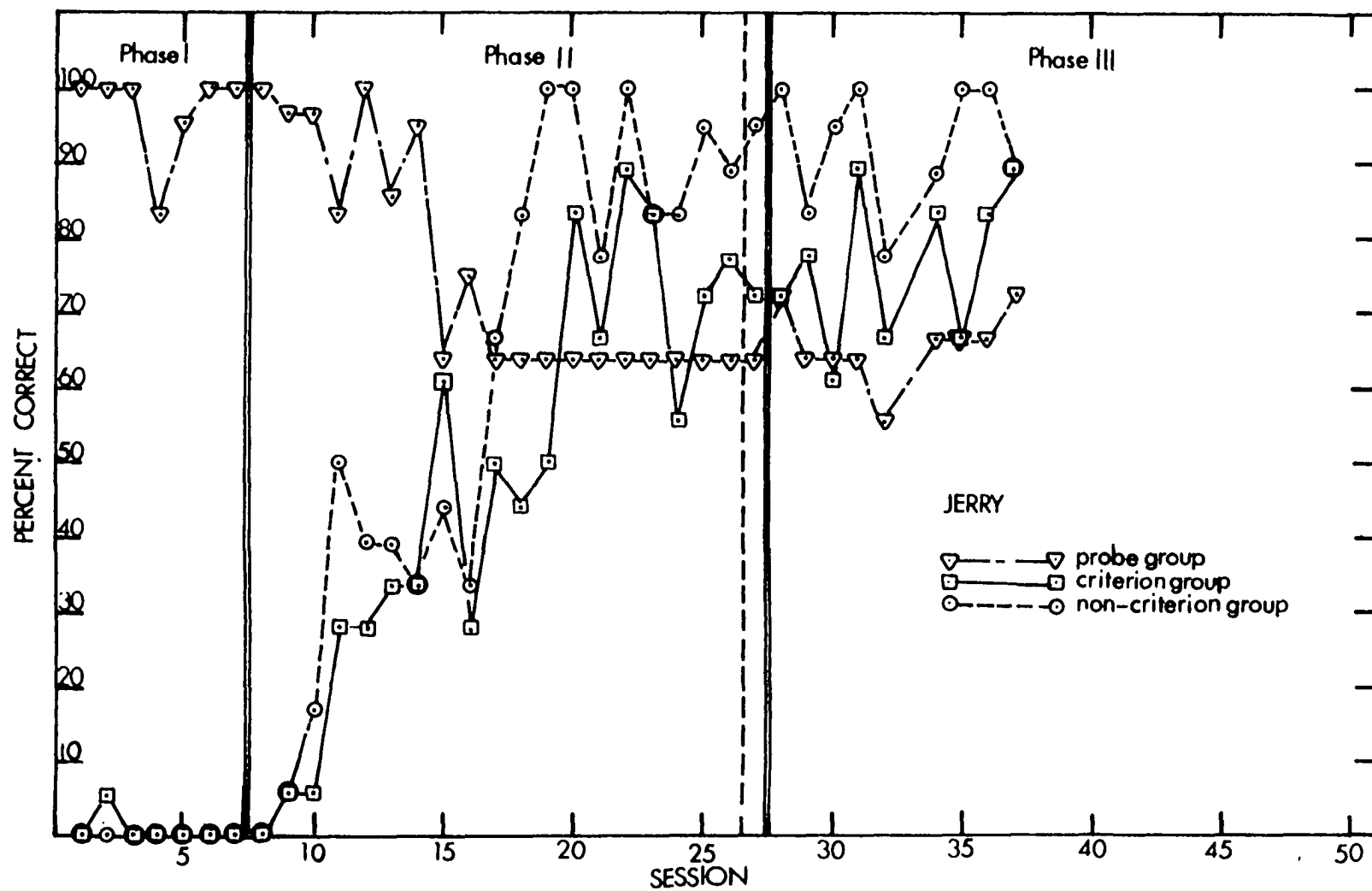


Figure 8. Jerry's texting performance on tests following classroom instruction for learned items (probe group) and new items (criterion and non-criterion groups).

two, it was difficult to get Jerry to emit responses to items that he did not know. On these occasions, he would sit at his desk and begin to blush, rather than emit a wrong response.

### Ruple

The data for Ruple can be seen in figure 9. His performance on the probes during phase one and two of the experiment ranged from a high of 97% to a low of 56%. The errors he made were never consistent, but changed from session to session. During phase three his performance on the probes improved significantly, and they were at 100% for the last seven sessions of the experiment.

Ruple's performance for the new items in both the criterion and non-criterion groups was at 0% during phase one. During phase two, he succeeded on one item each time it was asked on three different sessions. Other correct responses, however, would appear to have been chance occurrences. In the early part of phase three his performance rose for items in the non-criterion group more quickly than in the criterion group. (That item that had been correct three times in session two was not one of the items that contributed to his score.) After missing his criterion five times in eight sessions his performance on the criterion group began to rise consistently. By session 13 of phase three the performance was clearly better for items in the criterion group than in the non-criterion group.

It may be of interest, that Ruple did not appear to learn the new characters in the same fashion as did John and Harry. Whereas those children seemed to be learning several items at once, Ruple would

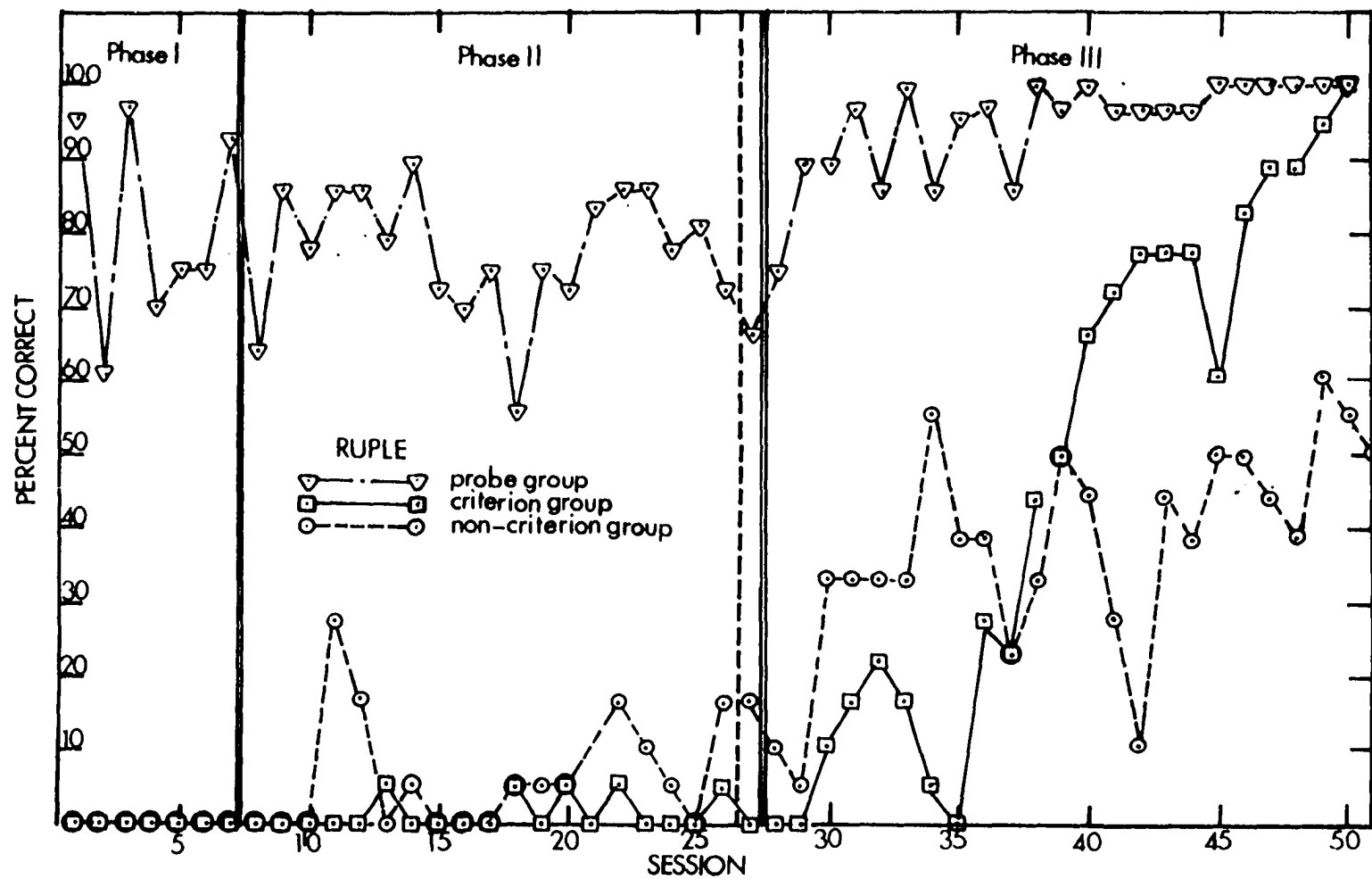


Figure 9. Ruple's texting performance on tests following classroom instruction for learned items (probe group) and new items (criterion and non-criterion groups).

typically learn one item, keep his performance consistent on that item, and then begin learning another one.

#### Ernie

The data for Ernie can be seen in figure 10. His performance on the probes throughout phase one and two was sporadic. Although it was somewhat higher during phase one, a pattern was developing wherein he would emit the same sound for every item that he was required to text. Early in phase two, this pattern became predominant and results that are above 0% are typically a result of him saying the same response for every item on the test. On the second session of phase three, however, his performance on the probes improved drastically. By session 4 of phase three it had reached a level of 97%. Thereafter there was a gradual decline which stabilized at the 83% level. This lower figure was mainly the result of one item which he consistently got wrong.

His performance on the new texts in both the criterion and non-criterion groups was virtually at the 0% level throughout phase one and two. When phase three began he missed his criterion four consecutive times before there was any improvement in his criterion group. By session 9 of phase three the performance for items in the criterion group was clearly better than that of the non-criterion group. When the experiment terminated, his performance for the items in the criterion group was 95% and that for the non-criterion group was 28%.

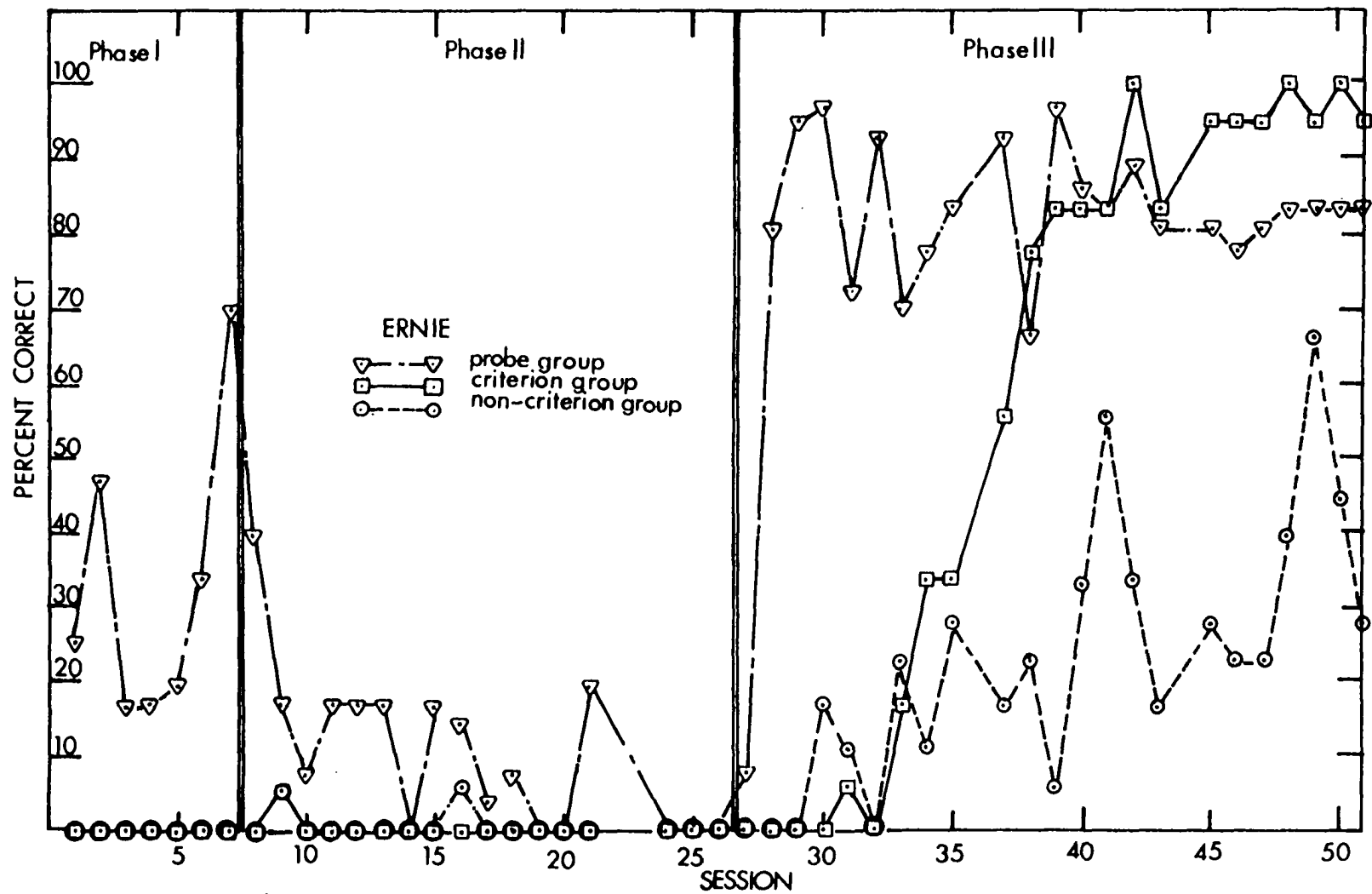


Figure 10. Ernie's texting performance on tests following classroom instruction for learned items (probe group) and new items (criterion and non-criterion groups).

## Jimmy

The data for Jimmy can be seen in figure 11. His results on the probes were typically at the 100% level during phase one of the experiment. During phase two, the performance oscillated considerably, but his errors may be described as "careless" errors. While he was acquiring new material during phase three his performance on the probes dropped significantly. He began emitting the vocal response appropriate for an item in his criterion group for one of the items that looked similar in the same color probe group. Interestingly, the response was correct for the same item in the other color probe group. The other error was similar in some respects. He emitted a vocal response appropriate for one of the items in the non-criterion group of new texts for one of the items in the probe group. This wrong response, however, occurred for the item in both the red and green group.

His performance for all the new texts was at a very low level during phase one of the experiment. Early in phase two his performance rose in a fashion not unlike that of Harry, Jerry and John. His performance stabilized, however, when he knew approximately half the items in each group of new characters. Although the performance fluctuated somewhat for the duration of phase two, upon conclusion it was clear that he knew three of the six characters in the group that would become his criterion group and probably four of the characters in the group that was not his criterion group.

By the fourth session of phase three he had reached the 100% level for both groups of new texts. For the next few sessions the performance

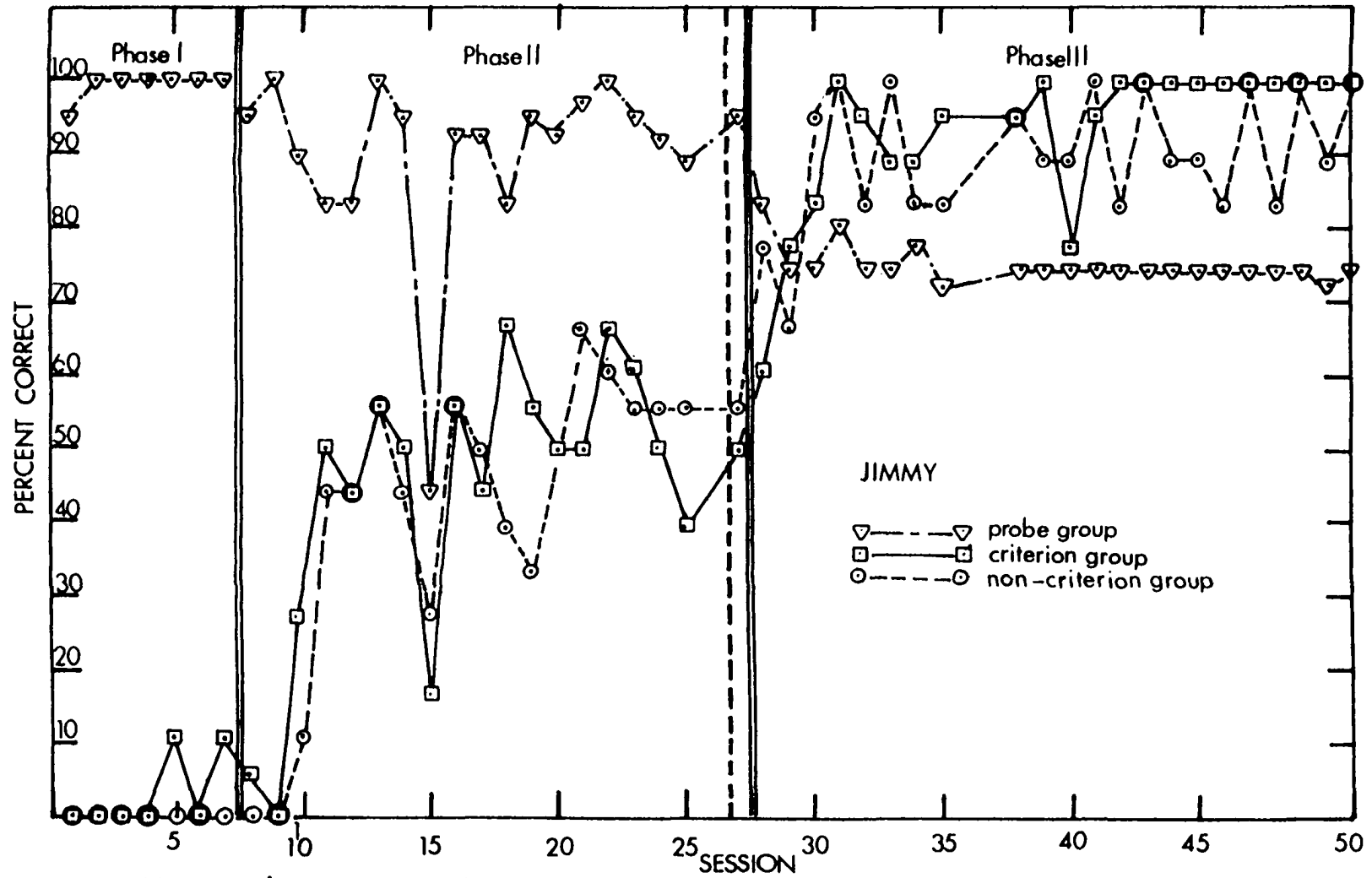


Figure 11. Jimmy's texting performance on tests following classroom instruction for learned items (probe group) and new items (criterion and non-criterion groups).

in both groups fluctuated somewhat, but the performance on the criterion group remained at 100% for the last nine sessions of the experiment, while he continued to confuse one item in the non-criterion group.

It is perhaps of interest to note that his performance improved on the very session that his criterion contingencies were applied. This was expected, as he clearly was aware of other children who had failed their tests on the previous session.

#### Dale

The data for Dale can be seen in figure 12. His performance on the probes was typically at the 100% level during phase one of the experiment. As phase two progressed the performance deteriorated, as he began to emit responses for the probes that were appropriate for new I.T.A. characters. This phenomenon continued throughout the experiment.

His performance improved for new I.T.A. characters in both groups during phase two of the experiment. When the phase three contingencies were imposed on his behavior, however, it was probably the case that he knew three of the characters in each of the groups of new texts. Early in phase three his performance improved for both the criterion and the non-criterion groups. At the end of the experiment, however, his performance on his criterion group of new texts was 95% while that for the non-criterion group was about 73%.

#### Jamie

The data for Jamie can be seen in figure 13. His probes were at the 100% level for the first four sessions of phase one. On the



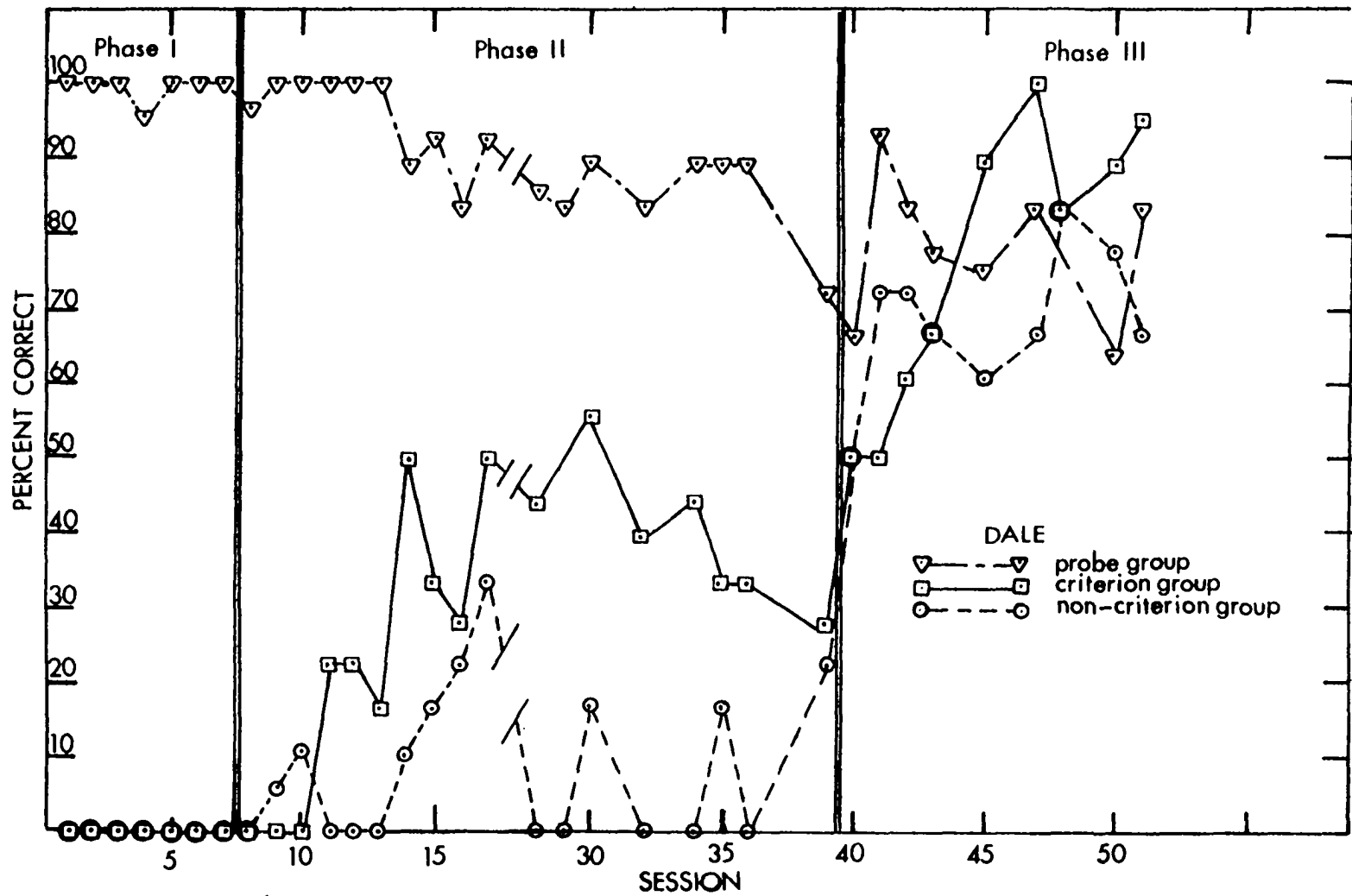


Figure 12. Dale's texting performance on tests following classroom instruction for learned items (probe group) and new items (criterion and non-criterion groups).

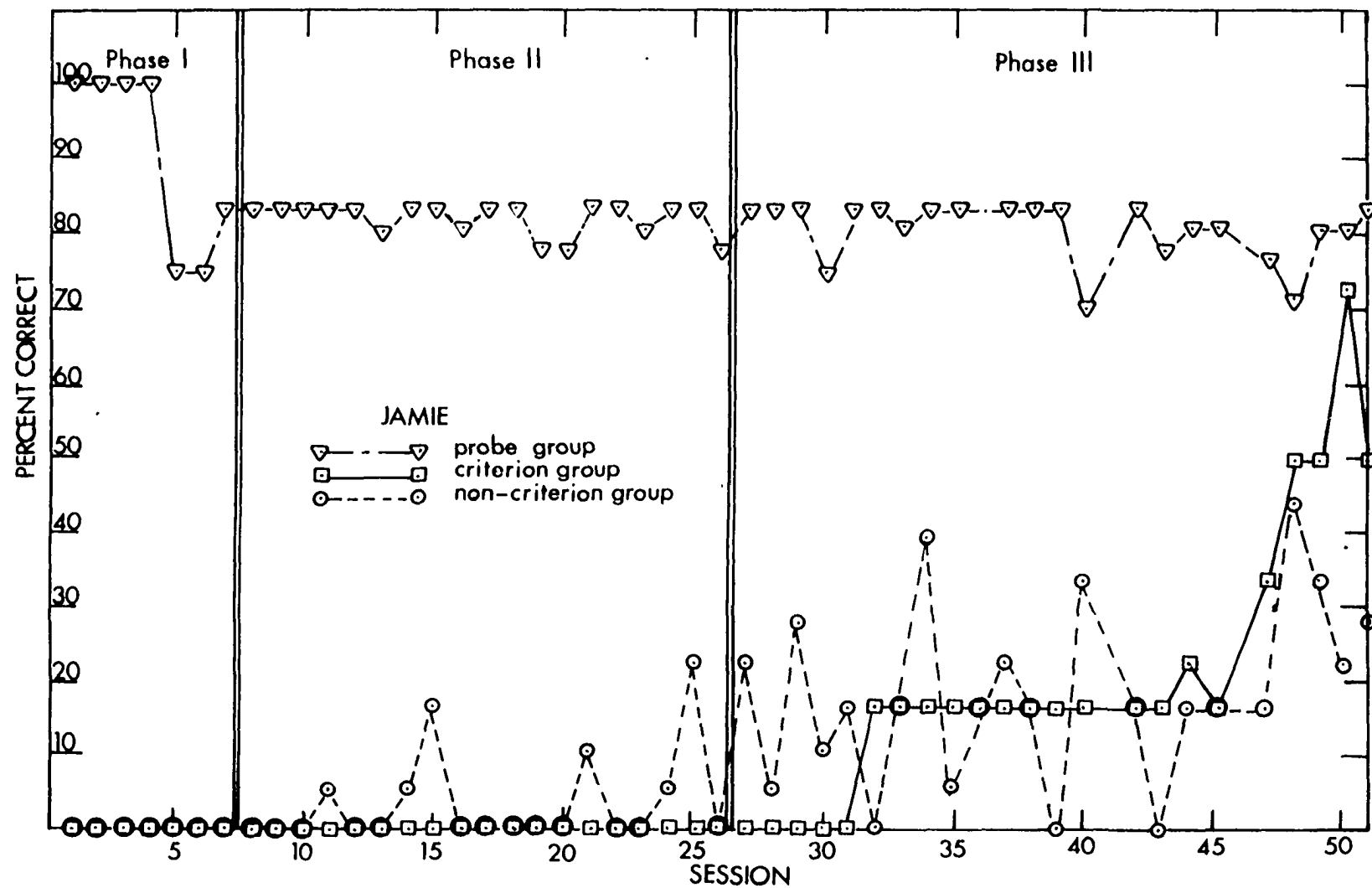


Figure 13. Jamie's texting performance on tests following classroom instruction for learned items (probe group) and new items (criterion and non-criterion groups).

fifth session, however, they decreased considerably. This was mainly a result of his emitting the vocal response "em" to the item which required that he say "mmm". This wrong response continued throughout the experiment and it was largely responsible for his lower scores on the probes.

His performance for all of the new items during phase one and two was very low. When he emitted correct responses they were typically of a chance nature as they were not consistent from session to session. During phase three, for items in the non-criterion group three were correct more often than others. He seemed to exhibit the same phenomenon as Jerry, in that he would get one item correct for several sessions and then replace it with another one. For items in the criterion group, however, he learned one item on session 6 and continued to get this item correct. When he learned a new response, typically it was said correctly all three times on the first session that the response was correct.

Jamie's performance for items in the criterion group did not improve significantly for many sessions after the beginning of phase three. It was not that he was unaware of the phase three contingencies. For items in his criterion group he would shake his head and say "I don't know." He responded freely, however, to items in the non-criterion group. Unfortunately, the experiment was terminated at a time when it appeared that he was beginning to learn the new characters.

#### Dennis

The data for Dennis can be seen in figure 14. His performance

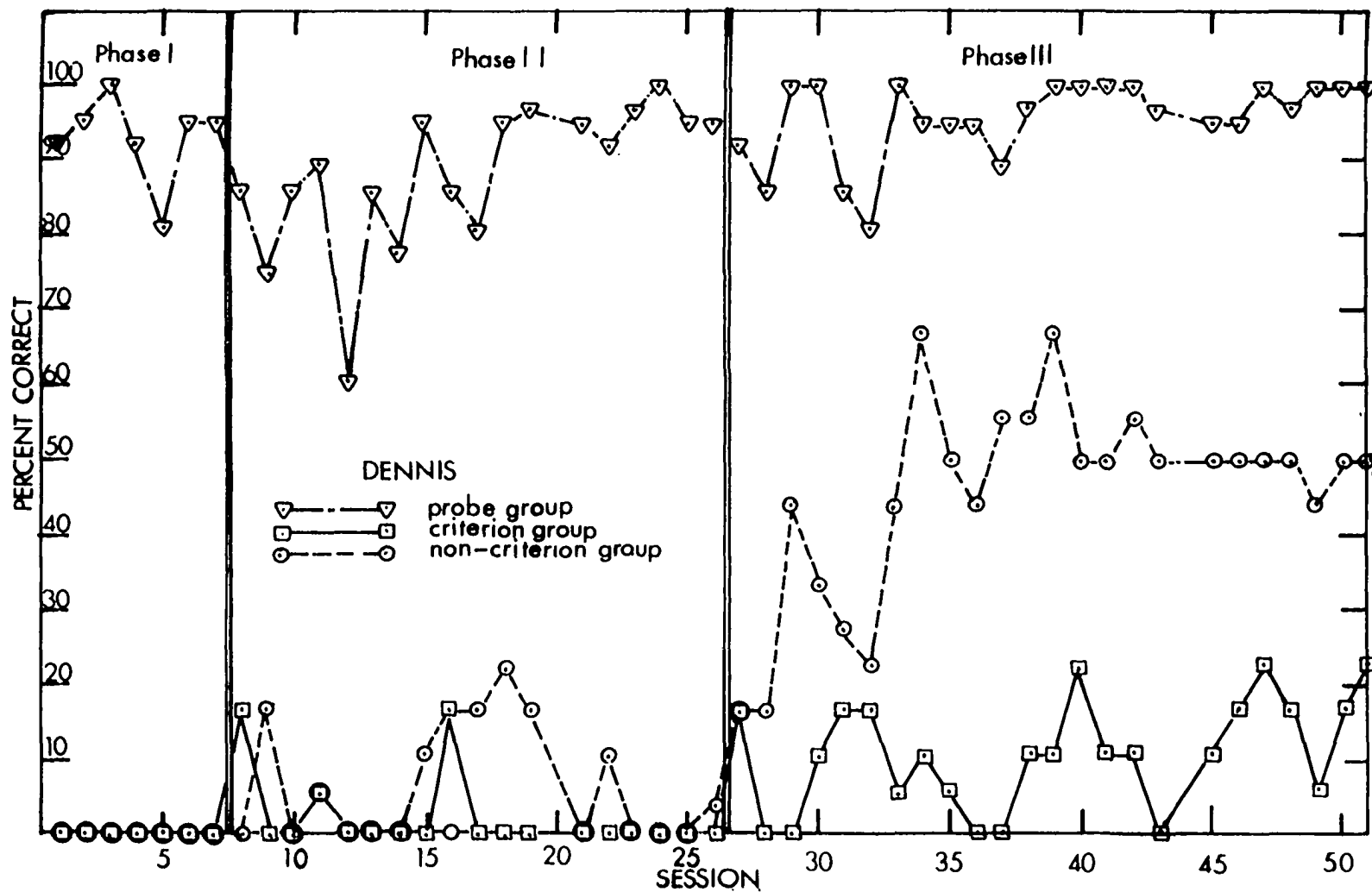


Figure 14. Dennis's texting performance on tests following classroom instruction for learned items (probe group) and new items (criterion and non-criterion groups).

on the probes remained at a reasonably high level throughout the experiment, although "careless" errors were made until the last few sessions of phase three.

His performance for the new texts was at the 0% level during phase one. During phase two, his performance for items in both groups of new characters occasionally rose above the zero mark and it appeared that he may have been close to knowing one item in each group. (On his first session of phase three he responded correctly to these two items.) As phase three continued, his performance improved steadily for items in the non-criterion group. He completed the experiment knowing three of the six characters in that group, but only one character in the criterion group.

Dennis' results were a complete reversal of those for every other child. He was the only child who needed extensive echoic training in the classroom because his articulation was very poor. When he emitted high quality echoics he received a good deal of social reinforcement from his peers. (When the teacher consequated a good echoic response after about 20 seconds of individual attention, the rest of the class would applaud.) This would seem to be the only way in which he was treated differently from the other children.

## CHAPTER V

## DISCUSSION

Two of the children learned all of the new textual material during phase two of the experiment, and as a result the function of the test as a delayed contingency could not be determined for these children. In addition, a third child learned the majority of the material during phase two, but he left for summer vacation before his performance on phase three could be evaluated. It was possible that for these children the phase two testing contingencies functioned in the same manner for them as did the stronger test of phase three for several of the other children. Perhaps they learned the new textual material as a result of subtle contingencies that were operative in the classroom setting, but unknown to the teacher. In any case, it would be of value to determine what variables were responsible for their behavior as their performance was clearly superior to that of the other children. If these variables were uncovered, perhaps it would be possible to get the other children's behavior under the control of similar variables.

The delayed testing procedures of phase three were of obvious value in teaching four of the children the new material. The data for these children, and particularly that for the two children who made the red-green discrimination during phase three, strongly suggest that the test contingencies of phase three were an important variable in controlling their acquisition of the new textual material. For them an adequate classroom procedure was to consequate good echoic behavior in

the classroom setting, while giving them the opportunity to text using the delayed contingency management technique.

For two other subjects, the delayed testing contingency was clearly an inefficient method of producing new textual behavior even though their textual repertoires changed during phase three. For example, one of these children only began to make progress after the majority of other children had learned the required material. It is important to note that these children progressed well in the system that was described in Chapter I of this report. Since the major change there was a set of texting contingencies in the classroom, by way of a series of single texting trials in each sequence, this may explain why Dennis learned material in the non-criterion group. Perhaps it was not a function of the delayed testing procedure, but rather accidental reinforcement of textual responses in the classroom while he was being helped with articulation difficulties.

To conclude: With variables consistent with this study it is clear that a delayed testing contingency can function effectively. In addition, it has been shown that trainable retardates can be taught elementary verbal skills in a classroom setting using group teaching procedures.

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