SOCIAL ACKNOWLEDGMENT OF READING:
MULTIPLE SCHEDULE EFFECTS

by

Pamela Phelan

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Abstract of Dissertation Presented to the Graduate Council of the University of Florida in Partial Fulfillment of the Requirements for the Degree of Doctor of Philosophy

SOCIAL ACKNOWLEDGMENT OF READING: MULTIPLE SCHEDULE EFFECTS

by

Pamela Phelan

August, 1976

Chairman: Donald Avila
Major Department: Foundations of Education

This study investigated the influence of social reinforcement on the reading behavior of children enrolled in a tutorial reading center. Four black third grade pupils from a Gainesville, Florida elementary school served as subjects. The basic data were daily rates of Flash Card responses and Oral Reading responses. Programmed instruction materials were adapted for use in this study. The study was divided into three experiments, each comprised of two experimental phases. The basic question being asked was whether there is a predictable relationship between the Multiple schedule of social reinforcement and the subjects' mean rates of response.
Social reinforcement was delivered by university students who functioned as tutors. Two tutors were assigned to each subject. The tutors taught subjects on alternate days in one-to-one sessions over a six-week period.

Experiment I investigated Multiple schedules of social reinforcement of correct responses in which the two Multiple schedule components were a Variable Ratio schedule and a Fixed Interval schedule. Schedule components assigned to tutors in Phase I were switched in Phase II. Experiment I included three subexperiments. The Variable Ratio schedule was expected to generate higher rates of responding than the Fixed Interval schedule in both phases.

Experiment II used a slightly different design called a contrast design. Multiple schedule components were equivalent in Phase I and in Phase II one of the components was changed. Correct responses were reinforced. Phase I components were a Variable Interval schedule and one of these was replaced by a Variable Ratio schedule in Phase II. A contrast effect was expected. Similar rates of responding were expected in Phase I. In Phase II the rates for the changed tutor were expected to increase from Phase I to Phase II and the rates for the unchanged tutor were expected to decrease from Phase I to Phase II.
Experiment III, similar to that of Experiment I, investigated the effects of Multiple schedules in which one of the two components reinforced error responses. The tutor that reinforced corrects in Phase I reinforced errors in Phase II, and the tutor that reinforced errors in Phase I reinforced corrects in Phase II. Experiment III was comprised of two subexperiments. Reinforcement was delivered on equivalent Fixed Interval schedules in the first subexperiment and on equivalent Variable Interval schedules in the second one. Higher rates of correct responses were expected to be generated by the tutors who reinforced corrects in both phases. Likewise, higher rates of error responses were expected by the tutors who reinforced errors in both phases.

The results of the three experiments were not in the expected direction. Two limitations of this study may have influenced the results. First, precise measurement of rate of response was impossible since the time used for reinforcement delivery was included in the total time used to calculate rate. Second, the verbal statements used by the white tutors as reinforcers may not have been reinforcing to the black subjects. This study demonstrates clearly, however, that social reinforcement research can be conducted on an educationally relevant behavior in a public school setting.

Chairman

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CHAPTER I
INTRODUCTION

All societies develop structures to resolve and modify conflict among their members. Mechanisms for allaying a conflict may be formal or informal. Laws and their enforcement codify norms while folkways and social standards informally govern behavior through social rewards and punishment. Social reinforcement is a societal or cultural tool for shaping and maintaining acceptable behavior.

The methodological application of social reinforcement techniques in the management of human behavior is a widespread practice. These management techniques have been used for training and supporting behavioral appropriateness in varied settings such as schools, mental health treatment centers, and homes. Since incorporation into daily operating procedures, social reinforcement techniques have become a viable tool for change.

While the need for pragmatic psychological procedures is recognized and, indeed, pursued by social agencies, there is little evidence of sustained application of social reinforcement techniques to cognitive task performance in education. This lack became increasingly clear as extensive literature research for the present study progressed.
Purpose and Importance of the Study

The major goal of this investigation is to examine social reinforcement effects on cognitive task performance. More specifically, this study investigates for the first time the effects of the systematic use of social reinforcement on the reading behavior of elementary school children.

A second aim is to develop research methodology and procedures for the application of laboratory technology to the study of social reinforcement effects in reading. The successful specification and implementation of these procedures will provide a research strategy for the continuous assessment of social reinforcement effects on reading behavior. Furthermore, implementation within the context of a remedial training program encourages the use of the natural environment for basic research programs.

It is significant that the literature on social reinforcement effects on cognitive task performance contains only a few references of its use over more than a few sessions' duration. Many current educators and research psychologists agree that (1) most of the existing studies are superfluous to an ongoing assessment of social reinforcement effects, and (2) that most studies fail to relate to the classroom teacher in more than an indirect fashion. For these reasons, the need for basic research in a context directly relevant to the educational process is obvious.
Past research germane to reading, using social reinforcement as the experimental treatment, has been limited to short term studies of letter discrimination, sight word vocabulary responding, and/or unit reading responses. This study investigates the effects of systematic manipulations of social reinforcement during long-term reading development.

Background of the Study: Two Major Research Projects

A substantial number of research reports which have direct and indirect bearing on this study will be reviewed in Chapter II. There are, however, two studies which have such a fundamental impact on the current investigation that they will be noted at this point. The first, representing a substantial program of research, explicates the term schedules of reinforcement. The second describes a study on schedules of token reinforcement of reading and has a direct bearing on the present investigation.

Schedules of Reinforcement

B.F. Skinner conducted the foundation research in the area of schedules of reinforcement. A lengthy work, Schedules of Reinforcement (Ferster and Skinner, 1957) summarized the whole of his investigations. From this work, the term schedule of reinforcement is defined as a systematic arrangement of response-reinforcement contingencies which vary the proportion of reinforced responses or the time intervals after which reinforcement is obtained.
Many response-reinforcement contingencies have been labeled, and derive from two categories of schedules: simple and complex. The six simple schedules are Continuous Reinforcement schedule (CRF), Fixed Ratio (FR), Variable Ratio (VR), Fixed Interval (FI), Variable Interval (VI), and Extinction (EXT). These are defined in the Glossary. Complex schedules combine two or more simple schedules. Some of the complex schedules are the Multiple schedule, the Mixed schedule, the Tandem schedule, and the Concurrent schedule.

Although it may be instructive to describe the various schedules and their pattern effects, it is beyond the scope of this paper to do so. However, description of the Multiple schedule is germane to an understanding of schedules in general and to the current study in specific. The Multiple schedule was used in both the present study and the token reinforcement study which will be discussed in the next section.

A Multiple schedule of reinforcement is one in which each of two or more randomly alternating schedules of reinforcement is signalled by the presence of a different stimulus. An example illustrating a Multiple CRF/EXT schedule is selected to clarify the definition. Consider that a subject is seated in a room with two lights overhead, one red and one green; with one lever and one receptacle in front of him. Illumination of the red light signals the CRF schedule, while illumination of the green light signals
the EXT schedule. For each lever press while the red light is illuminated the subject received a penny in the receptacle. Lever presses in the green condition produce nothing. Thus, it can be seen that the two stimuli, red and green lights, signal the occurrence of the two schedules, CRF and EXT.

Ferster and Skinner's major finding demonstrated that patterns of responding emerged unique to each schedule. For example, the VR schedule typically generated higher response rates than the VI schedule. Research has replicated these patterns with different species and reinforcers. The schedule was considered in control of the subject's behavior when the pattern emerged in the data.

The Staats Study

Schedule research on educationally important behaviors is rare. The utilization of social reinforcement in such investigations is virtually non-existent. A discussion of a token reinforcement of reading study is chosen to provide a frame of reference for understanding the present social reinforcement study. The purpose of the Staats study (Staats, Finley, Minke, and Wolf, 1964) was to demonstrate schedule control of human reading behavior. A description of the methodology and procedures is followed by a discussion of the results and their implications for the present investigation.

Each of four four-year-old subjects was assigned to one of four Multiple schedules of token reinforcement.
These schedules were Multiple CRF/EXT, Multiple CRF/VR, Multiple CRF/VI, and Multiple VR/VI.

An apparatus presented materials, delivered marble reinforcers, exchanged marbles for trinkets, and recorded data. The material presentation panel was mounted on top of a table in front of the subject. A doorbell-type push-button was also on the table in front of the subject. Four plexiglass windows, one centered above three others, were mounted on the panel. The printed material was viewed through the top window; a matching stimulus and two others through the bottom three windows. Beneath each of the lower three windows was a button which, when pressed, activated a marble dispensing device if the correct match was selected. Correct matching responses were reinforced by the delivery of a marble to a small box on the table. The subject could immediately exchange the marble for a small trinket or could place it in a tube for accumulation toward one of four more costly trinkets. A cumulative recorder recorded the subject's responses, the point of operation of the marble dispenser, and the point of delivery of a toy. The operation of the doorbell, windows, marble dispenser, exchange equipment, and cumulative recorder was controlled by electromechanical equipment.

A series of training sessions prepared the subject for the task of appropriately responding to the written materials. Initially simple echoic responding was reinforced. The response required for reinforcement gradually approximated
that of the experimental response which was vocalizations of written letter combinations.

The final chain of responses required for reinforcement was the following: the subject pressed the doorbell which resulted in the appearance of the reading characters in the windows; the Experimenter said the name of the character in the top window which the subject echoed; the subject, then pressed the button below the correct matching window which activated the marble dispenser. If the subject vocalized the correct response prior to the Experimenter's prompt, the Experimenter activated the marble dispensing machine. The chain began again when the subject pressed the doorbell for the display of a new set of characters in the windows.

Marble reinforcement occurred throughout the training and the experiment. During training every correct response was reinforced with the presentation of a marble. When the subject was ready to begin the experimental response chain, the Multiple schedule reinforcement contingencies were placed in effect.

Two procedures controlled the change of component and stimulus requirements of the Multiple schedules. During one component, an overhead light in addition to a light above the apparatus was illuminated. For the other component, just the overhead light was illuminated. The change of components of the Multiple schedule was determined
by the following: the CRF was in effect for 15 reinforcers, the VR for 5 reinforcers, the VI for 10 minutes, and the EXT for 5 minutes.

Response rates were reported for each of the components of the Multiple schedules. Results were discussed in terms of their compatibility with basic schedule research. Reference to this occurred in the previous section of this chapter. (1) The Multiple CRF/EXT subject produced rates in the CRF condition which exceeded the rates produced in the EXT condition. These results were compatible with basic research. (2) The Multiple CRF/VR subject produced rates in the VR condition in excess of those in the CRF condition. These results were compatible with earlier research. (3) The Multiple CRF/VI subject's production of higher rates in the CRF condition than in the VI condition was compatible with basic research results. (4) Unexpectedly the Multiple VR/VI subject produced approximately equal rates in both conditions. It had been assumed that the VR condition would generate decidedly higher response rates than the VI. In summary, each case in which the CRF schedule had been the comparison schedule resulted in data compatible with basic research findings.

These results demonstrated that basic research can be conducted on a significant human behavior. The laboratory analysis of token reinforcement effects has wide generalizability to both the study of reinforcement schedules and the development of reading. In this regard, a study with
a similar research paradigm which also utilizes social reinforcement would seem to have even greater applicability to human behavior and the educational process.

General Statement of the Research Purpose

This study will demonstrate the effects of Multiple schedules of social reinforcement upon the rate of verbal responses to written material by elementary school children. A study of this nature is without precedence. The application of laboratory technology to the development of reading in pupils enrolled in a remedial reading program increases its significance.

In Chapter II, the historical antecedents relating to the development of the specific research hypotheses will be presented and discussed. The review of literature is intended to place these introductory remarks within the perspective of an historical overview. The specific research hypotheses will then be presented in Chapter III where they are discussed with respect to research design and methodology.

Definitions of Terms

The following list of terms and their definitions is provided for the reader in order that they might fully understand the phraseology used in this work.
Baseline: the ongoing rate of a behavior prior to the introduction of the treatment.

Behavioral contrast or contrast effect: the effect on performance on an unchanged schedule of reinforcement to which the subject is exposed.

Celeration: basic unit of measurement of behavior change. Change in frequency per unit of time; movements/minute/week.

Concurrent schedule: Schedules which are in effect simultaneously, or which can follow one another in rapid succession.

Conditioned reinforcer: a reinforcer whose reinforcing effect depends upon a history of training. The actual reinforcer maintaining the rate of the behavior is the stimulus immediately following it. In the case of the pigeon, the reinforcement for pecking is the sound and light accompanying the operation of the food dispenser. These stimuli in turn set the occasion on which the pigeon may go to the feeder and eat.

Continuous Reinforcement schedule (CRF): reinforcement of every instance of a target behavior.

Contrast design: a design which will potentially produce the contrast effect.
Cumulative record: a graphic record which emphasizes the rate of performance or its frequency. In a cumulative record a recording pen moves along the abscissa with passage of time and along the ordinate each time a performance occurs. Thus, the rate of the performance is demonstrated by the slope of the curve.

Cumulative recorder: gives a continuous visual picture of the subject's rate of response.

Extinction (EXT): the operation of nonreinforcement.

Fixed-Interval schedule (FI): reinforcement is produced by the first response emitted after a certain time has elapsed since the last reinforcement.

Fixed-Ratio schedule (FR): the target response is reinforced upon completion of a fixed number of responses counted from the preceding reinforcement.

Geometric mean: the appropriate method for obtaining an average on a ratio scale. See Pennypacker, Koenig, and Lindsley (1972) for a description of how to determine the geometric mean on the Standard Behavior Chart.

Movement: recorded behavioral event. Usually specified in terms of movement cycle with a beginning, middle, and end.

Multiple schedule: A schedule in which reinforcement is programmed by two or more simple schedules alternating, usually at random, each schedule being accompanied by an appropriate stimulus as long as the schedule is in force. The simple schedules of a Multiple schedule are often called components of the Multiple schedule.
Rate: basic unit of behavioral measurement. Generally, number of movements per unit of time. Specifically, movements per minute; the measure found on the Standard Behavior Chart.

Schedule control: When performance appropriate to a particular schedule is generated by a stimulus which is not a primary reinforcer, the stimulus may be said to exert schedule control.

Schedule of reinforcement: a systematic arrangement of response-reinforcement contingencies which vary the proportion of reinforced responses or the time intervals after which reinforcement is obtained.

Standard Behavior Chart: a six-cycle logarithmic chart designed for the graphic display of ratio data such as rate.

Tandem schedule: A schedule of reinforcement in which a single reinforcement is programmed by two or more schedules acting in succession without correlated stimuli.

Target behavior: see movement. Typically, this would be the dependent variable.

Token reinforcement: usually a metal or plastic disc which an organism can carry around and exchange for privileges, food, or other items.

Variable-Interval schedule (VI): the same as FI except that the time from a reinforcement to the availability of the next reinforcement is variable.
Variable-Ratio schedule (VR): the same as FR except that the number of responses required for each reinforcement is variable, not fixed.

Limitations
Two limitations of this study may have influenced the results in a negative way, and one limitation influenced the generality of the findings. First, precise measurement of rate of response was impossible since the reinforcement delivery time was included in the total time used to calculate rate. It was expected that when compared with an FI schedule a VR schedule of reinforcement would generate higher rates of response. However, since the reinforcement density was greater during the VR than during the FI, there was less total time in which the subject could respond. This would affect the rate calculation. Second, it is not clear whether the verbal statements used by the white tutors as reinforcers were in fact reinforcing to the black subjects. The subjects may have lowered their rate of response in order to reduce the frequency of reinforcement. This may also explain the negative results. In this regard, the term reinforcer is used throughout the text, although this is not meant to imply that the events used as reinforcers were in fact reinforcing. Third, since there were only four subjects, there is no intent to generalize the results to any other subjects or populations.
CHAPTER II
LITERATURE REVIEW

This chapter integrates historical perspectives of social reinforcement research with the procedures of this study. The major developments found through review of the literature are (1) investigations of social reinforcement satiation and deprivation effects on conditionability; (2) evaluation of subject characteristics and their influence on the effectiveness of social reinforcers; (3) examinations of experimenter effect; (4) delineation of informative and affective roles of social reinforcement; and (5) systematic manipulations of the relationship between the response and reinforcement delivery. After indicating these developments, the literature review examines schedule research on the social reinforcement of reading and discusses the procedural requirements of such research.

Major Developments in Social Reinforcement Research

The five major developments represent differing views of the nature of social reinforcement. The purpose here is to present studies which most clearly exemplify those beliefs. In this regard, no attempt was made to summarize all experiments using social reinforcement. Instead, studies were selected which illustrate typical practices.
Satiation and Deprivation

In the past, theorists speculated that satiation and deprivation had opposing effects on social reinforcer effectiveness. Availability of social stimuli was said to determine the probable influence of reinforcement. Presumably deprivation enhanced the value of social reinforcement while satiation reduced the value. If so, then, reinforcement subsequent to a period of deprivation would result in a significantly greater production of behavior than would reinforcement after a period of satiation.

A common method of inquiry was to compare responsivity to reinforcement after isolation and non-isolation. Typically an "isolated" subject waited alone in a waiting room for a period of time prior to performing the experimental task while an adult remained with "non-isolated" subjects. The adult provided reinforcement during the task performance. The performance of the "isolated" subjects would be expected to be better than that of the "non-isolated" subjects. Studies like Erickson's (1962) and Gewirtz and Baer's (1958a,b) provided supportive results.

The unstimulating conditions of institutions for the retarded have also served as settings for social reinforcement research. Klaber, Butterfield, and Gould (1969) in a unique study compared the responsiveness of retarded persons from two such institutions; one Institution (A) which allowed social interaction, and Institution (B) which did not.
Interestingly enough, subjects selected from Institution A had in the recent past been residents of Institution B.

Children from both institutions were placed in a room with an adult and some toys. The data showed that Institution B subjects played for longer periods of time and maintained less distance from the adult than did Institution A subjects. Thus, the transferred subjects who had moved from deprived to less deprived circumstances appeared to need social interaction less than the subjects who remained in the low social interaction institution. One important interpretation of these results might be that the effects of social deprivation are reversible.

The study which demonstrated most succinctly the opposing effects of satiation and deprivation was the Landau and Gewirtz (1967) study. A critical feature of the design made the clarity of their results unequaled. Satiation levels were experimentally controlled and their effects on performance measured. "Well done's" administered at four frequencies, 4, 12, 30, or 60, consequent to correct discriminations describes the procedure. Subjects received one of the four frequencies of reinforcement during the satiation period and subsequently during the task performance.

The greater the frequency of reinforcement during the satiation period the less effective was the reinforcement on task performance. Furthermore, subjects who had received
the lower frequencies of reinforcement, 4 or 12, were conditionable, while the ones who received the higher frequencies, 30 or 60, were not. These results demonstrated that the effectiveness of a reinforcer may vary inversely with the frequency of its prior delivery.

**Subject Characteristics and Their Influence on Social Reinforcer Effectiveness**

This section discusses conclusions drawn from the body of research which investigated individual characteristics. Experimenters undoubtedly perceived that attributes native to the person were primary determinants of social reinforcer effectiveness. Research in this area attempted to establish which social reinforcer or set of reinforcers modified behavior most successfully, given an array of particular characteristics. Categories reviewed are (1) Personality, (2) Race, (3) Social Class, (4) Intelligence, and (5) Age.

**Personality**

The many dimensions of personality have been written about elsewhere (Hall and Lindzey, 1957). A few of these dimensions are dependence and independence, high and low self-concept, positive and negative self-image, introversion and extraversion, and internal and external locus of control. Placement along a continuum from one extreme to another was theorized to govern one's need for affection, reinforcement, and the like. It is seen that personality dimensions can in part determine the need system of an
individual which may relate to a need for particular kinds of feedback from others.

A crucial inference arose out of the social reinforcement research on personality. Personality, as a construct, was thought to determine the likelihood that a specific reinforcer affected behavior. That is, if the social reinforcer matched the needs of the personality, then it was likely to have a positive effect on behavior. If, however, the feedback created cognitive dissonance, improvement was less likely to occur. Thus, if the content, intensity and timing of the input was discrepant from the individual's needs at the moment it would be discredited or noninfluential (Baron, Bass, and Vietz, 1971; Todd and Nakamura, 1970).

Race

Family patterns and reinforcement styles may go hand in hand. Whereas there might be commonality among races, it seems evident that racial heritage exerts a strong influence on the development of family patterns (Hess and Shipman, 1965).

Baron, Heckenmueller, and Shultz (1971) examined black and white responsiveness to reinforcement styles by comparing the efficacy of two kinds of praise on performance: task oriented and person oriented. Task oriented feedback made reference to the quality of the task performed while person oriented commented on the "goodness" of the person performing.
In their study, blacks and whites responded differentially to the two forms of praise. Blacks given person oriented approval performed significantly better on the assigned task than those given task oriented feedback. Just the reverse was true for the white subjects: task oriented was more successful than person oriented. Although this study did not provide evidence to assume racial differences exist in family reinforcement patterns, it did support the notion that blacks and whites differ in their responsiveness to two forms of verbal feedback.

Social class

Social class has been found to influence health, intelligence, and personality. Thus, investigators have assumed there might be some relationship between social class and one's susceptibility to social reinforcement.

Marshall (1969) explored the effect of delayed and immediate feedback on the task performance of one hundred and sixty high and low class subjects. Subjects from both social classes learned equally as well with immediate verbal reinforcement. Low class subjects performed better with immediate than with delayed feedback while the high class subjects performed equally as well with either.

Reiner (1974) conducted a comparative study of different reinforcers, social, material, or knowledge of results, on middle and lower class children. Subjects performed problem solving and motor learning tasks in each reinforcement
condition. A dynamic interaction existed between social class, type of reinforcement, type of task, and grade level. Reiner concluded that the most potent reinforcers for particular types of children on specific kinds of tasks can be determined. These results stimulate thought about implications for training programs, individualized educational planning, and exposure to different reinforcement conditions.

Intelligence

Level of intelligence has been a discriminating factor in education since Binet developed his scales. In fact, it is common practice today for placement into a variety of regular and special education classes to be determined primarily by one's measured intelligence on group or individually administered tests. With an objective criteria for placement established, it seems reasonable for educators to search for motivational strategies for groups of children so readily identifiable.

Van de Riet (1963) attempted to find just such a strategy by researching the effectiveness of praise and blame on the performance of educationally retarded and non-retarded children. Blame was found to be significantly more effective with retarded children while praise worked best with non-retarded children. Moreover, clinical observation suggested that praise produced anxiety in the retarded subjects. It might be concluded that blame created less
cognitive dissonance and therefore became a more effective incentive for retarded subjects than praise.

Prominent researchers in the area of social reinforcement and the intellectually retarded, Panda and Lynch (1972), established strict guidelines for the choice of appropriate feedback used with retarded pupils in educational settings. Criteria were that the social reinforcers (1) not be redundant, (2) be contingent upon behavior, and (3) be reliably structured. Non-contingent occurrence of feedback was thought to inhibit performance. Thus, while verbal support may have been a necessary condition for learning, its effectiveness was enhanced by the contingent presentation of diverse social reinforcers which provided information about the quality of performance.

Age

Much has been written about the intellectual, physical, emotional and moral development of children (Mussen, 1973). Developmental psychologists have extensively described the behavior patterns inimical to particular age stages in a child's life. A little known area of developmental research examined changes in perceptions of the meaning of social reinforcers from childhood to adulthood.

Solomon and Ali (1972) surveyed individuals from childhood to adulthood on their use of either content or intonation as the primary determinant of the meaning of a social reinforcer. Their data yielded distinct age trends.
Content seemed more important for younger subjects, whereas intonation was fundamental in the adult subjects' evaluation of the meaning of the reinforcing stimuli.

Summary

To summarize the section on subject characteristics, the following tentative conclusions are offered. (1) For social reinforcement to be effective its content, intensity, and timing must be appropriate to the momentary needs of the individual. (2) Racial differences in responsiveness to some kinds of verbal feedback may exist. (3) Criteria for the selection of social reinforcers are that the reinforcer not be redundant but be contingent on behavior and reliably structured. (4) Developmental trends appear in perceptions of the meaning of social reinforcers. It is inferred that the relationship between the subject and the effectiveness of a social reinforcer is a complex one whose determinants seem to vary from moment to moment.

Experimenter Effects

The now famous Rosenthal studies examined the influence of the experimenter on the results of psychological and behavioral research (Rosenthal, 1966). Several conclusions can be stated regarding experimenter effect on subject behavior. These may have implications for a study in which an adult interacts with a child as the treatment variable. The conclusions are as follows: (1) Subjects extract information from the investigator's attributes in order to
respond in their preconceived "right" manner; (2) The experimenter as a person and what has happened to him before or happens during the experiment affects the subject's responses. The subject's responses subsequently affect the experimenter's behavior which in turn can alter the subject's response; (3) Characteristics of the experimenter influence the subject's behavior in a direct way but sometimes interact in a subtle fashion with subject characteristics, task characteristics, or situational characteristics; and, (4) The principal investigator must rely on the process of replication in order to control for experimenter effects.

In a unique application of Rosenthal's work, Leventhal and Fischer (1970) attempted to determine whether differences in performance could be attributable to characteristics of the experimenter per se or to his reinforcing statements. Ninety-six subjects were exposed to experimental conditions in which the experimenter was seated near and away from the subject and did not reinforce, or in which he was seated near the subject but did reinforce. Dependent variables were rate and preference of placing marbles in holes. The results showed that the subject's rate differed even before reinforcement was initiated.

Therefore, it was concluded that reinforcement itself was not solely responsible for the condition differences.
It would appear that preference changes reflected the subject's effort to extract information from the experimenter's behavior, while base rates and rate changes reflected complex alterations in the subject's emotional state. . . It is difficult not to express some surprise at the unimportance of reinforcement. (p. 92)

The authors qualify their conclusions by stating that "perhaps reinforcement effects would be noticeable if alterations were made in the procedure and experimental design" (p. 92). The remainder of this review discusses studies in which reinforcement did make a difference.

**Informative and Affective Roles**

Social reinforcement has been said to serve two purposes: to inform about response accuracy and to create a positive feeling (Panda, 1971). A positive feeling is created when a person is made to feel good in order to be confident of making an appropriate choice. Response accuracy occurs when a person is informed whether their choice was accurate in order to continue successful choices. Regardless of divergency of purpose, the objective of both purposes of reinforcement is to motivate the subject to perform with greater accuracy.

**Informative role**

Information theory states that when motivating children the cueing and signalling aspects of reinforcement are more important than any feelings aroused. Investigators have compared the effectiveness of transmitting correct,
incorrect, or no information to subjects after subject responses (Siegel and VanCara, 1971; Meyer and Offenback, 1962; Spence, 1966).

Typically information is given either verbally or with non-social cues, like marbles, subsequent to each task response. Experimenters divided subjects into three groups labeled "Rb," "Wb," and "RW." In the "Rb" group subjects were informed when they were right but not when they were wrong. In the "Wb" condition only the wrong answers were consequated. In the "RW" group subjects were informed of both correct and incorrect responses.

Probably the most important educational application of information theory was a study by Panda (1970) in which eighty educable mentally retarded boys assigned to one of two conditions were tested on a concept learning task. Subjects received either RW information or RW plus non-contingent verbal support after each block of four trials. RW subjects performed with significantly higher accuracy than did those who received RW information plus verbal support. Unconditional support seemed to serve as a distractor. Therefore, it appears that a reinforcer intended for one purpose, to make the subject feel good, may be counterproductive for another purpose, to improve the subject's performance. However, because non-contingent verbal support was found to be distracting does not imply that the same interpretation applies to contingent verbal support.
Affective role

Affective feedback was intended to create either a positive or negative feeling in the child. In turn the feeling was thought to motivate the child to perform at a faster rate or higher accuracy. Drive reduction theory provides a frame of reference for understanding the role of affective feedback. Within such a framework, the subject performs to achieve a positive feeling or to reduce the presence of a negative feeling. Thus, instead of providing information the intent was to support or criticize the person so that performance would improve. Studies, then, attempted to determine whether praise or blame worked best for a particular type of subject or task (Binet and Vaschide, 1897; Leith and Davis, 1969; Kelly and Stevens, 1964; Hurlock, 1924).

Relationship Between the Response and Reinforcement Delivery

Developments thus far reviewed have conceptualized the nature of reinforcement on a theoretical basis. Investigators attempted to explain why social reinforcers had a reinforcing effect on behavior. This section attends to the empirical conceptualization. Empiricism concerns itself primarily with the effect. There is considerable emphasis to determine what environmental event may have precipitated the effect, but only minimal interest in understanding why (Sidman, 1960).
The shift in conceptualization from theoretical to empirical has correlated with methodological modifications in research strategy. There was a movement away from pre/post-like experimental designs to designs which prioritized the control of a phenomena. Although many studies exist which utilized group statistical designs, this section discusses only those which used single subject designs.

Two basic methods of manipulating social reinforcement in order to investigate the relationship between the response and reinforcement delivery will be discussed. These methods were the presentation and withdrawal technique and the more complex schedule of reinforcement paradigm.

**Presentation and withdrawal**

The presentation and withdrawal technique has assumed some prominence in both research and applied settings. It is described here as it relates to the modification of social and academic behavior in the classroom. First, the research technique will be elaborated upon. Then, a group of studies which clearly exemplifies the practice will be examined.

A single subject design, which is a one-to-one correspondence between the emission of target behavior and reinforcement, in addition to the baseline technique, characterized this research strategy. An idiographic model allowed the investigator to look at the effect of treatment
variables on the individual subject. A study typically included more than one subject but results were discussed relative to each individual's responsivity. Social reinforcement was either delivered for each occurrence of the desired behavior and/or withheld if an undesired behavior occurred.

A general notion of the technique used to demonstrate reliable control of a behavioral change will be set forth. First, data was collected on the frequency of the target behavior over a period of time establishing a baseline level of its occurrence against which treatment was applied and its effect recorded. Third, the original baseline condition was reintroduced meaning that treatment was withdrawn. If the final frequency of behavior approximates that of the original baseline, it is inferred that the experimental treatment precipitates the effect observed in the treatment phase. Within this framework, researchers conducted studies in the classroom.

The modification of aberrant social behaviors has increased classroom harmony and served to make children more acceptable to each other and adults (Thomas, Nielsen, Kuypers, and Becker, 1968). Several studies set as their goal the elimination of disruptive behavior and the increased production of on-task performance (Wasik, Senn, Welch, and Cooper, 1969; Thomas, Becker, and Armstrong, 1968; Broden, Bruce, Michell, Carter, and Hall, 1970; Hall, Lund, and Jackson, 1968). Idiosyncratic problem behaviors
of children such as crying (Allen, Hart, Buell, Harris, and Wolf, 1964), isolate behavior (Harris, Wolf, and Baer, 1967), passive play (Hart, Allen, Buell, Harris, and Wolf, 1964), and non-cooperative play (Redd, 1969) have been successfully treated as well.

Academic behavior modification has received far less research attention than the modification of social behavior. One notable exception, though by no means the only one, a study by Hasazi and Hasazi (1972), investigated the digit reversal behavior of an elementary school child. Baseline observation found that the teacher responded to reversals and ignored correct digit placement. Not atypically, she marked reversals incorrect and gave "extra help" on all sums incorrectly written. For the treatment the teacher was instructed to socially reinforce correct digit placement and ignore reversals. The results showed a sharp decrease.

It is concluded from the research on the presentation and/or withdrawal of social reinforcement that the technique represents a powerful tool for modifying behavior as well as a viable research paradigm for the demonstration of the control of social and academic behavior.

**Schedules of social reinforcement**

In contrast to simply presenting or withdrawing social reinforcement contingent upon the occurrence of a behavior, schedules represent an intricate way of varying the presentation of reinforcement in relation to the response.
As previously defined, a schedule is a systematic arrangement of response-reinforcement contingencies which vary the proportion of reinforced responses or time intervals after which reinforcement can be obtained. The resulting effect of such manipulation has been called the patterning effect.

Due to methodological problems indigenous to such research, there have been few studies (Lahey and Drabman, 1974; Staats et al., 1962; Chadwick and Day, 1971). The next section provides an overview of the broader topic, schedule research on reading. This topic includes but is not restricted to a survey of token schedule research and a discussion of the procedural application of such studies to one which investigates social reinforcement schedule effects. Such review provides a framework for resolving methodological problems.

**Summary of Historical Developments**

The historical developments reviewed included satiation and deprivation effects, subject experimenter influence, characteristics, informative and affective roles of social reinforcement, and the relationship between the response and the delivery of reinforcement. Each of these developments was presented within the context of their differing views of the nature of reinforcement. Attention was paid to the methodological and procedural components of studies which investigated those views. The next section integrates
schedule research of reading with the procedural requirements of one which uses social reinforcement.

Schedule Research on Reading

Studies which manipulated token and social reinforcement schedules will be discussed in view of the application of methodological characteristics pertinent to the present investigation.

Schedules of Token Reinforcement

Token reinforcement is generally used within a system called the token economy (Ayllon and Azrin, 1968). The token economy refers to an economic system of payment for appropriate behavior in which the tokens earned can be saved and later exchanged for valuables. Tokens, then, can be exchanged for objects of value much the same as currency is exchanged for goods in our society. Their worth is enhanced by their relevance to real currency, by the fact that the subject can manipulate and transport them, and by their readily understandable value.

One particular characteristic of tokens make their use as a reinforcer advantageous in research (O'Leary and Drabman, 1971). The delivery of the token is a discrete event which has a definite effect on the environment. Therefore, unlike food and social reinforcement, it can be reliably dispensed and counted.

While Staats and his associates have conducted by far the most schedule research on reading behavior (Staats,
Staats, Schutz and Wolf, 1962; Staats, Finley, Minke, and Wolf, 1964; Staats, Minke, Finley, Wolf, and Brooks, 1964) other researchers have made significant contributions as well. A few studies that have a direct bearing on the present investigation will be presented.

Lovitt, Eaton, Kirkwood, and Pelander (1971) investigated the effects of four reinforcement contingencies on oral reading. Subjects responded to the contingencies while reading from an experimental reader. Results were compared with reading rates of the same subjects from control readers.

The experimental contingencies were designated as follows. In Experiment I if the pupil's correct rate exceeded and error rate was less than prescribed limits he was reinforced on a 25:1 ratio. For every two errors in Experiment II one token was taken away. In Experiment III for every correctly read word the pupil received one token. In Experiment IV the pupil earned one token for every thirtieth correct response. No tokens were delivered when the subjects were reading from the control readers.

Procedurally, the pupil read from each book five minutes per day. The order in which he read the books was randomly alternated. Errors were handled the same throughout all Experimental groups. That is, if the pupil mispronounced a word, he was immediately told the word. Tokens could be exchanged for minutes of free time at the end of the ten minutes of reading from the control and experimental readers.
The results are summarized as follows. In Experiment I, where the contingency affected both correct and error responses, both types of responses were influenced. In Experiments II and III, the contingencies focused on errors, and errors were more influenced than were correct responses. In Experiment IV where the contingency was placed on correct responses, correct responses were influenced in the first half of the experiment but not in the latter half. In most cases, both correct and error rates in the control reader were not as positively influenced as in the experimental reader.

Sibley (1966) investigated reading rate and accuracy as a function of Fixed Ratio schedules of token reinforcement. Seven subjects of normal intelligence who were designated as poor readers participated in the experiment. There were three phases in the experiment. In Phase I non-exchangeable points were delivered on a Fixed Ratio for correct reading responses. In Phase II non-exchangeable points and tokens were delivered simultaneously on a gradually increasing Fixed Ratio schedule. Tokens were exchangeable for back-up reinforcers. The final phase was a return to Phase I conditions.

Points were not found to be initially reinforcing, but became strikingly so subsequent to being paired with tokens. Four of the seven subjects showed increased reading rates as the FR was increased. Three showed the reverse trend.
Some evidence was found to indicate that high ability subjects read faster on the higher Fixed Ratios.

Hoeltzel (1973) investigated the effects of single and multiple-ratio schedules of token reinforcement on reading rates. Like the Lovitt et al. (1971) study the Experimental and Control reader approach was used. Four subjects read five minutes per day from each book. There were no contingent phases with the Control reader but with the Experimental reader contingent and non-contingent phases were alternated weekly for seven weeks. Generally, the results indicated increased correct responding during contingent phases of the Experimental reader as well as an overall tendency toward increased error acceleration. These results generalized to the Control reader only when the contingent phase was in effect with the Experimental reader.

It is seen from the review of token schedule studies that results generally support the notion regarding patterning effect of schedules. That is, schedules produce particular effects which can be observable across reinforcers, behaviors, and subjects.

**Schedules of Social Reinforcement**

While there have been few studies which investigated social reinforcement schedule effects, the Mays (1970) study used social reinforcement schedules to determine their influence on error production. This investigation looked at the effect of schedules of reinforcement on the
elimination of errors in oral reading. Social reinforcement, "Fine" and "Good," was delivered on either a VI or VR schedule. The VI schedule was programmed by tape and the VR by penciled marks in the book being read.

The response unit was a sentence and reinforcement was delivered if the entire sentence was correct. Although correct sentences were reinforced, the dependent variables in the Mays study were rate of error production and general error strength. Therefore, there was no attempt to analyze the direct influence of the schedule of social reinforcement on the response being reinforced.

Procedural Requirements of a Study of Social Reinforcement Schedule Effects on Reading

The application of procedures from studies of token reinforcement schedule effects to a tutoring situation in which social reinforcement is used is complex. This section will discuss three pertinent procedural aspects which need to be ascertained before such application can begin. These three procedural needs are (1) the importance of the discrete delivery of the reinforcer, (2) clarification of the nature of the reading response, and (3) the need to methodologically control the learning-to-learn phenomenon. The application of these remarks will be presented in Chapter III.
Importance of the discrete delivery of the reinforcer

Ayllon and Azrin (1968) stated that the following rule should govern the selection of a conditioned reinforcer. It should "provide a distinctive and tangible stimulus event to bridge any delay between the desired response and the delivery of the reinforcer" (p. 77).

Their work, The Token Economy, outlines the advantages of tokens as conditioned reinforcers. These advantages are (1) delivery is quantitatively related to the amount of reinforcement, (2) portability, (3) possession in infinite amounts, (4) usefulness to operate machines, (5) durability and tangibility, (6) ease of standardization of physical characteristics, (7) indestructibility, (8) non-duplicability, (9) reinforcement of response at any time, and (10) reinforcement occurrence without interruption.

Social reinforcement possesses some of these advantages but also has some critical disadvantages. The advantages are (1) it represents an immediate stimulus following a response, (2) does not disrupt performance, and (3) allows the response to be strengthened. The disadvantages include the following: (1) it is a momentary and, therefore, intangible event, (2) the qualitative dimensions do not allow for standardization, and (3) it cannot be used to operate machines.

Nature of the reading response

There are many definitions of reading. The definitions range from reading as comprehension to reading as decoding
(Singer and Ruddell, 1970). Some experts maintain that a child has not read a word until he has comprehended it. Others define reading as the act of saying or decoding a written word. The proponents of the latter definition partial out the decoding and comprehension components of reading as separate behaviors. Decoding and the comprehension of what was decoded are considered to be two distinct behaviors. The present investigation embraces this concept of reading.

It was thought to be critical to the intent of the present research to narrow the response datum to the frequency of words read in time. Sidman wrote in *Tactics of Scientific Research* (1960) that the response should be one "whose relevant characteristics are easily recordable, with minimal interference from the process of observation itself. [Additionally]. . . there should be minimal con-straint upon the subject's rate of responding" (p. 395).

The repertoire necessary in order that the child can decode is complex. Words can be counted as discrete responses in time, but words are not equal in complexity. Each word decoded represents a lengthy chain of responses. The differing complexity of the words as units and as they fit in the context of the sentence and paragraph make for possible variability in resulting data. The response can be recorded cumulatively in time but each is not necessarily an instantaneous unitary response (Staats, Finley, Minke,
and Wolf, 1964). Therefore, while the limitation of the response datum to counting words read simplifies data collection, the attendant experimental results may not be as clear were the response a simple bar press.

Control of the learning-to-learn phenomenon

The previous section implied that the nature of the reading response induces inherent variability and thus confusion in the data. An additional complication is the need to continually increase the complexity of the reading material as skill level improves. Control of this learning-to-learn phenomena is important in order that variability in the data be due to the experimental manipulations and not to materials or skill level.

Two methods have been devised to assist in controlling for this variability. The first has to do with the selection of materials and the second has to do with the presentation of the materials to the subject. These two methods will be elaborated in the remainder of this section.

Material selection. Staats, Finley, Minke, and Wolf (1964) wrote that in order to study experimental effects on long-term reading, materials were needed which do not affect the learning curve. The ideal material would be homogeneous in content, such as programmed reading materials. For this study the Science Research Associates Laboratory 1a (SRA Lab 1a) reading materials were chosen (Parker and Scannell, 1961).
Performance Determined Instruction Model (PDI) was developed by Gray, Baker, and Stancyk (1969) at the Monterey Institute for Speech and Hearing as an instructional procedure for obtaining changes in reading performance. The methodology combines aspects of binary logic, laws of learning, and programmed instruction. The PDI model was designed as a method for decision making to discriminate which procedures to employ with the individual subject.

A host of procedures was developed by the Institute to help the child read at the desired reading level. One procedure, related to the acquisition of sight word vocabulary, is described here. The application of this procedure to this investigation will be presented in Chapter III.

This precision instruction approach makes several assumptions regarding the nature of reading which relate to the development of the training procedures. First, reading is considered to be a learning task and, therefore, subject to the laws of learning. Second, decoding the word is antecedent to comprehension and therefore should be taught first. Third, a training system should provide frequent and immediate reward for successful performance. Fourth, characteristics such as visual perception, intelligence, visual motor coordination, visual and auditory sequencing and the like are considered not to affect differentially the prognosis for skill mastery unless the deficiency is of such a marked and gross degree that it results in reduced functional ability in nonreading activities.
The procedure for the acquisition of sight vocabulary incorporates a computer logic system known as TOTE (Test-Operation-Test-Exit) which was originally conceived by Miller, Galanter, and Pribram (1960). Basically the steps within a TOTE system occur similarly to the following sequence. First, the behavior in question is measured against some standard. Second, if the behavior is discrepant to some specified degree from the standard an operation is performed to help the behavior reach the goal. Third, the behavior is tested again. If the behavior reached the standard, the program is terminated. If, however, the behavior did not reach the standard, the behavior is treated. The TOTE system provides a structure for decision making.

More specifically the TOTE system was applied in the PDI model to improve sight word vocabulary performance. This application will be described in some further detail.

A target performance of 92 percent accuracy plus or minus 2 percent was set as the standard against which to measure performance. Performance was measured against the standard and operations were chosen if the performance was either above or below the accuracy range. Questions were asked and based on the answer decisions were made regarding whether to terminate, to reduce task difficulty, or to increase task difficulty.

The following questions or steps were devised to control the performance accuracy of sight word vocabulary performance. First, was the performance accuracy within
the range prescribed for three successive sessions? If the answer was yes, Question 2 was asked. Was the reading age level up to the target age level? If yes, training was terminated. If the answer to Question 1 was no, Question 3 was asked. Was the performance above the range; that is, were three successive sessions above 94 percent? If the answer was yes, then, the subject was advanced to the next level of difficulty. If the answer to Question 3 was no; that is, three successive sessions were below 90 percent, then a decision was made to move to the level on which performance was last within the acceptable accuracy range.

The next chapter will describe how the TOTE system and PDI model for sight vocabulary building was applied in this study. As indicated, it was considered necessary to develop procedures which would control the learning-to-learn phenomenon. Procedures maintaining accuracy level within a particular range were necessary to control variability in performance to such a degree that treatment effects might be more readily observable. It was important to describe the procedures here in detail as a frame of reference for understanding the unique procedures designed for the current study.
CHAPTER III
METHODS AND PROCEDURES

The purpose of this chapter is to present those methods and procedures selected in order to investigate whether there is a predictable relationship between Multiple schedules of social reinforcement and subjects' mean rate of responses on Flash Card and Oral Reading tasks. Chapter I defined a Multiple schedule as one in which two or more simple schedules randomly alternated, and in which the occurrence of the simple schedules was accompanied by a stimulus. This study used tutors as the stimuli associated with the different simple schedules.

Three experiments were designed to investigate the relationship between Multiple schedules and rate of response. In each experiment the Multiple schedule consisted of two simple schedules. Comparisons were made between the data derived from the subjects' rate of response in the presence of the two simple schedules. Experimental procedures will be discussed in more detail in the final section of this chapter.

The contents of Chapter III will be presented in the following sequence: (1) Research hypotheses, (2) Subjects, (3) Tutors, (4) Remedial Reading program, (5) Setting, (6) Apparatus, (7) Materials, (8) Data Collection, (9) Data for Data Analysis, and (10) Procedures. This latter section
includes those procedures common to all three experiments. These procedures are (1) Flash card procedures, (2) Oral reading procedures, (3) Adaptation of the Performance Determined Instruction model, and (4) Point reinforcement procedures. Finally, the chapter concludes with an overview of the experimental procedures unique to each experiment.

Research Hypotheses

A brief introduction to each experiment will be followed by a list of research hypotheses. The introduction will include the nature of the two simple schedules compared and a description of the experimental design used in each experiment. This information should provide a framework in which to understand the research hypotheses. Like the Staats (Staats, Finley, Minke, and Wolf, 1964) study reviewed in Chapter I, the research hypotheses will state which schedule is predicted to generate the higher rate of response.

Experiment 1

Experiment I examined Multiple schedules of social reinforcement in which both simple schedules reinforced correct responses. Three subexperiments make up Experiment I. There were two experimental phases in each subexperiment with approximately 16 sessions in each phase. The simple schedules, a Variable-Ratio (VR) schedule and a Fixed-Interval (FI) schedule, assigned to tutors in Phase I were switched in Phase II.
Research hypotheses

This experiment tested six hypotheses relevant to Multiple schedule effects on Oral Reading and Flash Card responses.

1. Subexperiment I-1 Flash Card Phase I and II mean VR correct rates will be higher than the mean FI rates.
2. Subexperiment I-1 Oral Reading Phase I and II mean VR correct rates will be higher than the mean FI correct rates.
3. Subexperiment I-2 Flash Card Phase I and II mean VR correct rates will be higher than the mean FI correct rates.
4. Subexperiment I-2 Oral Reading Phase I and II mean VR correct rates will be higher than the mean FI correct rates.
5. Subexperiments I-3 Flash Card Phase I and II mean VR correct rates will be higher than the mean FI correct rates.
6. Subexperiment I-3 Oral Reading Phase I and II mean VR correct rates will be higher than the mean FI correct rates.
Experiment II

A contrast design is used in Experiment II to demonstrate the effects of Multiple schedules of social reinforcement. In this two phase experiment, the following contrast design is employed: (1) the two Phase I simple schedules are identical and (2) one of the simple schedules is changed in Phase II. This change is said to produce a contrast effect defined in Chapter I. Phase I simple schedules were both a Variable-Interval (VI) schedule. One of these schedules was changed in Phase II to a VR schedule. The tutor with the lower average rate in Phase I changed to a VR schedule in Phase II.

Research hypotheses

This experiment tested four hypotheses relevant to Multiple schedule effects on Flash Card and Oral Reading responses.

1. The median of the differences between correct rates of the two schedules in Phase I for Flash Card and Oral Reading is zero (p = .05). This null hypothesis will be tested by the sign test (Siegel, 1956).
2. Experiment II Phase II mean VR rate will be higher than the mean VI rate for Flash Card and Oral Reading.

3. Experiment II Phase II mean VR rate will be higher than the mean VI rate for that tutor in Phase I for Flash Card and Oral Reading.

4. Experiment II Phase II mean VI rate for the unchanged tutor will be lower than the mean VI rate for that tutor in Phase I for Flash Card and Oral Reading.

Experiment III

Experiment III investigated the effects of Multiple schedules of social reinforcement in which both simple schedules were the same but one reinforced correct responses and one reinforced error responses. Two subexperiments make up Experiment III. The simple schedules used in Subexperiment III-1 were both an FI schedule. In Subexperiment III-2 both schedules were a VI schedule. Each subexperiment was divided into two experimental phases. If assigned correct responses to reinforce in Phase I the tutor reinforced errors in Phase II and vice versa.

Research hypotheses

This experiment tested nine hypotheses relevant to Multiple schedule effects on Oral Reading and Flash Card responses.
1. Subexperiment III-1 Flash Card Phase I and II mean correct rates for the tutor that reinforced corrects (RC) will be higher than the mean correct rates for the tutor that reinforced errors (RE).

2. Subexperiment III-1 Flash Card Phase I and II mean RE error rates will be higher than the mean RC error rate.

3. Subexperiment III-1 Oral Reading Phase I and II mean RC correct rates will be higher than the mean RE correct rates.

4. Subexperiment III-1 Oral Reading Phase I and II mean RE error rates will be higher than the mean RC error rates.

5. Subexperiment III-2 Flash Card Phase I and II mean correct rates in the RC component will be higher than the mean correct rates in the RE component.

6. Subexperiment III-2 Flash Card Phase I and II mean error rates in the RE component will be higher than the mean error rates in the RC component.

7. Subexperiment III-2 Oral Reading Phase I and II mean RC correct rates will be higher than the mean RE correct rates.

8. Subexperiment III-2 Oral Reading Phase I and II mean RE error rates will be higher than the mean RC error rates.
Subjects

Four eight-year-old third grade pupils from an elementary school in Gainesville, Florida served as subjects. All subjects were black, two were female and two were male. The four subjects who participated in the study were selected from a pool of 60 subjects. Two third grade teachers were asked to select pupils from their classes who in their estimation were able to read at the mid-first grade level. The teachers picked seven pupils. This number was reduced to the final four necessary for the study. In order to be selected, the following criteria had to be met:

1. a grade level performance between 1.3 and 1.6 on the Lee-Clark Reading Test, and
2. 90 to 95 percent oral reading accuracy on a 1.5 grade level SRA Lab la story. Each of the final four met these criteria.

Tutors

Seven undergraduate University of Florida students served as tutors. Two were male and five were female. The students received university course credit for their participation in the study.

Tutors took part in a ten hour training program prior to the beginning of the experiment proper. The program included a didactic overview of methods and procedures, supervised practice of the tutoring of other tutors and
of the tutoring of nonexperimental pupils. Practice 
administering the procedures described in the latter portion 
of this chapter was supervised by the experimenter.

Remedial Reading Program
The subjects attended a remedial reading program 
directed by the experimenter. Daily hour long sessions 
were divided into 40 minutes of task performance and 20 
minutes of play. The tasks were administered in the 
following sequence: flash card drill, oral reading, written 
comprehension exercises, and phonetic drill. Points 
earned during these tasks could be exchanged after forty 
minutes had elapsed. The flash card and oral reading 
performance provide the data for this study.

Setting
The setting was a room in Kirby-Smith Elementary 
which had been divided into seven tutoring stations. These 
were separated from each other by plywood partitions. In 
the remainder of the room were a play area and a materials 
center. Activities available in the play area included 
games, art materials, and comic books.

Apparatus
Apparatuses included timing devices and a point 
dispenser. Each tutoring station was equipped with either 
a standard stopwatch or an electromechanical timing device.
These were used to clock task duration precisely and to aid in delivering points and social reinforcers at the appropriate times. The point dispenser was a self-inking rubber stamp which fit into the eraser end of a pencil. Points were placed on Point sheets specially designed for this study. An example of a Point sheet is shown in Appendix A.

**Materials**

Oral reading and flash card supplies were the materials used for this study. Reading selections from the Science Research Associates Reading Laboratory 1a (SRA Lab 1a) served as the oral reading materials. SRA Lab 1a contained seven levels of reading difficulty with 20 stories per level. The levels ranged from the 1.2 grade level to the 3.0 grade level. A flash card unit was made from words appearing in a particular level of stories. Each word in the reading level was represented once in its corresponding flash card unit.

**Data Collection**

The Daily Data Sheet (DDS) was designed to allow for the collection of data during the task performance. Space was provided for the tutors to note the time and also to note correct and error responses as they occurred during each task. Thus, the data collected could be easily
corrected into the frequency of responses in time or rate of responding. An example of the DDS is shown in Appendix B.

Data for Data Analysis

The basic datum in this study was rate of responding. Rate was determined by dividing the frequency of correct or error by the duration of the task. These rates were recorded daily on the Standard Behavior Chart (SBC) and these raw data are shown in Appendix C. The results are expressed in terms of the average rates of response per schedule per phase. Since these data are ratio data, the averages used are geometric means.

Procedures

Procedures common to the three experiments will be described in this section. These procedures are (1) Flash card procedures, (2) Oral reading procedures, (3) Adaptation of the PDI model, and (4) Point reinforcement procedures.

Flash Card Procedures

The tutor administered the flash card unit which corresponded with the oral reading level assigned for that day. Flash cards were administered for ten minutes. The following standard procedures were developed. If the word on the card was correctly read within three seconds, the tutor placed the card in the correct pile and presented
the next card. If, however, the word was not read within three seconds or was read incorrectly, the tutor pronounced the word for the subject to repeat. The card was, then, placed in the error pile. When five of these error cards had accumulated, they were shuffled and represented. The above procedures were in effect until no more than two error cards remained. A new card was then presented.

**Oral Reading Procedures**

The subject read one reading selection orally in its entirety per session. Error responses were treated in a manner similar to those which occurred during the flash card performance. That is, if the subject did not read the word within three seconds or read the word incorrectly, the tutor pronounced the word for the subject to repeat. Each error was noted on the DDS as it occurred. Total number of correct responses was calculated by subtracting the total number of errors from the total number of words in the story.

**Adaptation of the PDI Model**

The rationale for the utilization of the PDI model was discussed in Chapter II. This section explicates those procedures which were adapted from the PDI model for the oral reading task of this study.
Each 20 story level in SRA Lab 1a was divided into four five-story units. Stories one through five, six through ten, eleven through fifteen, and fifteen through twenty made up the five units.

Like the PDI model, and accuracy level of 90 to 95 percent was established. A series of questions were asked of the data in order to decide whether to increase or decrease the level of difficulty of stories selected. If the subject read the first five stories in a level at an average of 90 to 95 percent accuracy, he continued to the next unit. If, however, the subject read the first five stories below an average of 90 percent accuracy, he re-read those that he had read the least accurately until he had attained an average of 90 to 95 percent for five consecutive days. If the subject read the stories in a unit at an average accuracy above 95 percent, the next unit was skipped unless the unit to be skipped was the first unit of a level.

These procedures did not apply to the flash card task. As long as the subject read stories at a particular level, he responded to the flash cards which corresponded to that level.
Point Reinforcement Procedures

Point procedures included both their delivery and exchange. All subjects received points on a Fixed Interval 90 second schedule. That is, during each task of the 40 minute work session subjects received a point every 90 seconds immediately after the first correct response. Times for point delivery were listed in the upper left hand corner of the DDS. Point exchange occurred at the end of the session. The points could be spent for minutes of time in the free play area, for pieces of candy, or for polaroid pictures. Exchange ratios were 1 point per 1 minute of free play, 5 points per piece of candy, and 10 points per polaroid picture. Subjects could elect to save points. They were allowed to save any number of points and were allowed to buy no more than 15 minutes of free play, 2 pieces of candy, and 1 polaroid picture per day.

Experimental Procedures

Three experiments were designed to demonstrate the effects of Multiple schedules of social reinforcement on rate of correct and/or error Flash Card and Oral Reading responses. The previous section described those procedures which were common to each experiment. This section describes the social reinforcement procedures unique to each experiment.
Social Reinforcement Procedures

Descriptions of the kinds of verbal statements used as social reinforcers, the delivery procedures, and the monitoring of their delivery is presented here.

Kinds of statements used with the schedules

Four groups of verbal statements were selected on the basis of their face validity and grouped into categories labeled High (H), Low (L), Consoling (C), and Disapproving (D). The first two groups were used to consequate correct responses and the latter to consequate errors. Samples of these statements are shown in Table 1. Table 2 shows the schedules and the kinds of statements used in each experiment. Explanations of the schedules were provided in the Definition of Terms section of Chapter 1.

Delivery procedures

Tutors delivered social reinforcement according to a schedule. The schedule to which they were to adhere on a particular day was written in the upper left hand corner of the DDS. If the tutor was to reinforce on a time based schedule, a list of the times when reinforcement was due was provided. If, however, the tutor was to reinforce on a response based schedule, the list contained the number of responses per reinforcement. Space was provided on the DDS for the tutors to note the occurrence of social reinforcers.
Table 1. Verbal Statements Used as Reinforcers

<table>
<thead>
<tr>
<th>High (H)</th>
<th>Low (L)</th>
<th>Consoling (C)</th>
<th>Disapproving (D)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Three in a row right</td>
<td>Good</td>
<td>That was close</td>
<td>Wrong</td>
</tr>
<tr>
<td>Great</td>
<td>Fine</td>
<td>Almost</td>
<td>Don't miss it again</td>
</tr>
<tr>
<td>What a good reader</td>
<td>Okay</td>
<td>Half right is better than nothing</td>
<td>Not again</td>
</tr>
<tr>
<td>Yeah, you got it</td>
<td></td>
<td>Boy are these tough</td>
<td>I just told you that one</td>
</tr>
<tr>
<td>That's a girl (boy)</td>
<td></td>
<td>Maybe next time</td>
<td>Try harder</td>
</tr>
<tr>
<td>Hurray!</td>
<td></td>
<td>They've got to get easier</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>You'll get the next ones</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>There's another rough spot</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Parts of this story are pretty rough</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Better luck next time</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Everyone makes mistakes</td>
<td></td>
</tr>
</tbody>
</table>
Table 2. Multiple Schedules and the Kinds of Statements Used in Each Experiment

<table>
<thead>
<tr>
<th>Experiment</th>
<th>Sub-experiment</th>
<th>Phase I</th>
<th>Phase II</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Tutor 1</td>
<td>Tutor 2</td>
</tr>
<tr>
<td>I</td>
<td>I-1</td>
<td>VR3</td>
<td>FI 10'</td>
</tr>
<tr>
<td></td>
<td></td>
<td>H</td>
<td>L</td>
</tr>
<tr>
<td></td>
<td>I-2</td>
<td>FI 60''</td>
<td>VR3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>L</td>
<td>H</td>
</tr>
<tr>
<td></td>
<td>I-3</td>
<td>FI 10'</td>
<td>VR3</td>
</tr>
<tr>
<td></td>
<td></td>
<td>L</td>
<td>H</td>
</tr>
<tr>
<td>II</td>
<td></td>
<td>VI 60''</td>
<td>VI 60''</td>
</tr>
<tr>
<td></td>
<td></td>
<td>L</td>
<td>L</td>
</tr>
<tr>
<td>III</td>
<td>III-1</td>
<td>FI 30''</td>
<td>FI 30''</td>
</tr>
<tr>
<td></td>
<td></td>
<td>L</td>
<td>C</td>
</tr>
<tr>
<td></td>
<td>III-2</td>
<td>VI 60''</td>
<td>VI 60''</td>
</tr>
<tr>
<td></td>
<td></td>
<td>L</td>
<td>D</td>
</tr>
</tbody>
</table>
Monitoring of social reinforcement delivery

The experimenter monitored social reinforcement delivery by observing the tutors and giving them feedback. Two of the tutors were selected at random and observed daily: one during Flash Card and one during reading. A determination was made of the expected number of reinforcers to be delivered on a given task. Actual number of reinforcers was, then, counted during the observation. The tutors received written and oral feedback regarding the difference between the actual frequency of reinforcers and the expected number. The feedback was delayed until the end of the entire work session in order that the tutor not know that he or she had already been observed.

In summary, this chapter has provided a description of the methods and procedures used in the investigation. The remedial reading program as well as a description of the sample and data collection process were provided. A detailed description of the procedures common and unique to each experiment was presented. The next chapter will present the results of this investigation with respect to the questions asked by the hypotheses outlined in this chapter.
CHAPTER IV
RESULTS

In this chapter the results of the study will be presented. The experiments and their respective subexperiments are grouped in units. A brief introduction to each subexperiment is followed by a presentation of its results. Included in these results sections are statements of the acceptance or rejection of the hypotheses relevant to each subexperiment. Results are presented in tabular form in this chapter and Standard Behavior Charts of the raw data are to be found in Appendix C. The basic question being asked is whether there is a predictable relationship between the Multiple schedule of social reinforcement and the subject's mean rate of responses. Table 3 provides an overview of the results which will be presented in detail in the remainder of this chapter.

Experiment I

Experiment I examined Multiple schedules of the social reinforcement of correct Flash Card and Oral Reading responses. Three subexperiments were each comprised of two experimental phases. The schedule components assigned to the tutors in Phase I were switched in Phase II. The means of the correct rates by component and phase are presented for Flash Card and Oral Reading tasks. Error rate data was collected; but, it is not reported here since this experiment manipulated correct responses.
<table>
<thead>
<tr>
<th>Experiment</th>
<th>Sub-experiment</th>
<th>No.</th>
<th>Hypothesis</th>
<th>Accept/Reject</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>I-1</td>
<td>1</td>
<td>Flash Card mean VR correct rate will be higher than the mean FI correct rate in both Phases</td>
<td>Reject</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>Oral Reading mean VR correct rate will be higher than the mean FI correct rate in both Phases</td>
<td>Reject</td>
</tr>
<tr>
<td>I</td>
<td>I-2</td>
<td>3</td>
<td>Flash Card mean VR correct rate will be higher than the mean FI correct rate in both Phases</td>
<td>Accept</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4</td>
<td>Oral Reading mean VR correct rate will be higher than the mean FI correct rate in both Phases</td>
<td>Reject</td>
</tr>
<tr>
<td>I</td>
<td>I-3</td>
<td>5</td>
<td>Flash Card mean VR correct rate will be higher than the mean FI correct rate in both Phases</td>
<td>Reject</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6</td>
<td>Oral Reading mean VR correct rate will be higher than the mean FI correct rate in both Phases</td>
<td>Reject</td>
</tr>
<tr>
<td>II</td>
<td></td>
<td>1</td>
<td>The median of the differences between correct rates of the two schedules in Phase I for Flash Card and Oral Reading is zero (p=.05)</td>
<td>Reject</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>The Phase II mean VR rate will be higher than the mean VI rate for Flash Card and Oral Reading</td>
<td>Reject</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3</td>
<td>The Phase II mean VR rate will be higher than the mean VI rate in Phase I for that tutor for Flash Card and Oral Reading</td>
<td>Accept</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4</td>
<td>The Phase II mean VI rate for the unchanged tutor will be lower than the mean VI rate for that tutor in Phase I</td>
<td>Accept</td>
</tr>
</tbody>
</table>
Table 3. Acceptance or Rejection of Hypotheses (Continued)

<table>
<thead>
<tr>
<th>Experiment</th>
<th>Sub-Experiment</th>
<th>No.</th>
<th>Hypothesis</th>
<th>Accept/Reject</th>
</tr>
</thead>
<tbody>
<tr>
<td>III</td>
<td>III-1</td>
<td>1</td>
<td>Flash Card mean correct rates for RC will be higher than the mean correct rates for RE in both Phases. (a)</td>
<td>Accept</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2</td>
<td>Flash Card mean error rates for RE will be higher than the mean error rates for RC in both Phases</td>
<td>Reject</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3</td>
<td>Oral Reading mean correct rates for RC will be higher than the mean correct rates for RE in both Phases</td>
<td>Reject</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4</td>
<td>Oral Reading mean error rates for RE will be higher than the mean correct rates for RC in both Phases</td>
<td>Reject</td>
</tr>
<tr>
<td>III-2</td>
<td></td>
<td>5</td>
<td>Flash Card mean correct rates for RC will be higher than the mean correct rates for RE in both Phases</td>
<td>Reject</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6</td>
<td>Flash Card mean error rates for RE will be higher than the mean error rates for RC in both Phases</td>
<td>Reject</td>
</tr>
<tr>
<td></td>
<td></td>
<td>7</td>
<td>Oral Reading mean correct rates for RC will be higher than the mean correct rates for RE in both Phases</td>
<td>Reject</td>
</tr>
<tr>
<td></td>
<td></td>
<td>8</td>
<td>Oral Reading mean error rates for RE will be higher than the mean error rates for RC in both Phases</td>
<td>Reject</td>
</tr>
</tbody>
</table>

(a) "RC" means: the tutor that reinforced correct responses
"RE" means: the tutor that reinforced error responses
Subexperiment I-1

An eight-year-old female served as the subject (S3). Tutors 1 and 2 were two females. The Multiple schedule components were VR3H and FI 10 minute L (FI10'L).

Results

Hypothesis 1 stated that the mean VR rate will be higher than the mean FI rate within both phases of the Flash Card performance. Table 4 shows the correct rates and the means of those rates by component and phase for the Flash Card performance of S3. In Phase I the mean VR rate of correct responses was 4.98. The mean FI rate was 7.11. In Phase II the mean VR rate of correct responses was 5.27, and the mean FI rate was 5.56. These data show that the mean VR rate during the Flash Card performance was lower than the mean FI rate within both phases. Therefore, Hypothesis 1 is rejected.

Hypothesis 2 stated that the mean VR rate will be higher than the mean FI rate within both phases of the Oral Reading performance. Table 4 shows the Oral Reading correct rates and the means of those rates. In Phase I the mean VR rate was 35.27 whereas the mean FI rate was 30.5. In Phase II the mean VR rate was 29.47, and the mean FI rate was 33.92. These data show that (1) the mean VR rate was higher than the mean FI rate in Phase 1, and (2) the mean VR rate was lower than the mean FI rate in Phase II.
Table 4. Mean Rates of Correct Responses in EXPERIMENT I

<table>
<thead>
<tr>
<th></th>
<th>Phase I</th>
<th></th>
<th>Phase II</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>VR</td>
<td>FI</td>
<td>VR</td>
<td>FI</td>
</tr>
<tr>
<td>I-1</td>
<td>Flash Card</td>
<td>4.98 7.11</td>
<td>5.27</td>
<td>5.56</td>
</tr>
<tr>
<td></td>
<td>Reading</td>
<td>35.27 30.50</td>
<td>29.47</td>
<td>33.92</td>
</tr>
<tr>
<td>I-2</td>
<td>Flash Card</td>
<td>11.46 11.14</td>
<td>9.44</td>
<td>8.69</td>
</tr>
<tr>
<td></td>
<td>Reading</td>
<td>29.41 31.75</td>
<td>28.79</td>
<td>31.56</td>
</tr>
<tr>
<td>I-3</td>
<td>Flash Card</td>
<td>8.16 8.50</td>
<td>8.29</td>
<td>10.02</td>
</tr>
<tr>
<td></td>
<td>Reading</td>
<td>32.96 36.91</td>
<td>31.13</td>
<td>40.53</td>
</tr>
</tbody>
</table>
Therefore, Hypothesis 2 is rejected because the mean VR rate was higher than the mean FI rate in Phase I alone.

**Subexperiment 1-2**

A nine-year-old male served as the subject (S4). Tutors 1 and 2 were a female and a male respectively. The Multiple schedule components were VR3H and FI 60 seconds L (FI60"L).

**Results**

Hypothesis 3 stated that the mean VR rate will be higher than the mean FI rate within both phases of the Flash Card performance. Table 4 shows the correct rates and the means of those rates for the Flash Card performance of S4. In Phase I mean VR rate was 11.46, and the mean FI rate was 11.14. In Phase II the mean VR rate was 9.44, and the mean FI rate was 8.69. These data show that the mean VR rate was higher than the mean FI rate within both phases of the Flash Card performance. Therefore, Hypothesis 3 is accepted.

Hypothesis 4 stated that the mean VR rate will be higher than the mean FI rate within both phases of the Oral Reading performance. Table 4 shows the correct rates and the means of those rates for the Oral Reading performance of S4. The mean VR rate in Phase I was 29.41, and the mean FI rate was 31.75. In Phase II the mean VR rate was 28.79, and the mean FI rate was 31.56. Thus, the mean VR
rate was lower than the mean FI rate within Phase I and within Phase II. Thus, Hypothesis 4 is rejected.

Subexperiment I-3

S4 participated in Subexperiment I-3 subsequent to his participation in Subexperiment I-2. Tutors 1 and 2 were both females. Multiple schedule components were VR3H and FI 10 minute L (FI10'L).

Results

Hypothesis 5 stated that the mean VR rate will be higher than the mean FI rate within both phases of the Flash Card performance. Table 4 shows the Flash Card correct rates and the means of those rates. In Phase I the mean VR rate was 8.16, and the mean FI rate was 8.50. In Phase II the mean VR rate was 8.29, and the mean FI rate was 10.02. Therefore, the mean VR rate was lower than the mean FI rate within both phases. Thus, Hypothesis 5 is rejected.

Hypothesis 6 stated that the mean VR rate will be higher than the mean FI rate within both phases of the Oral Reading performance. Table 4 shows the Oral Reading correct rates and the means of those rates. The mean VR rate in Phase I was 32.96, and the mean FI rate was 36.91. In Phase II the mean VR rate was 31.13, where the mean FI rate was 40.53. These data show that the mean VR rate was lower than the mean FI rate within both phases. Therefore, Hypothesis 6 is rejected.
Summary of Experiment I Results

Experiment I examined Multiple schedules of social reinforcement in which one of the two components was a VR schedule and the other was an FI schedule. The results of the three subexperiments were discussed relative to the six hypotheses presented in Chapter III.

The data clearly demonstrate that (1) Hypothesis 3 was accepted; (2) Hypotheses 1, 2, 4, 5, and 6 were rejected; (3) whereas Hypotheses 1, 4, 5, and 6 were rejected, the FI component maintained a consistently higher mean rate than did the VR component within Phases I and II; and (4) Hypothesis 2 results were in the expected direction in Phase I, but they were not in the expected direction in Phase II. The implications of these results will be discussed in Chapter V.

Experiment II

Experiment II examined Multiple schedules of social reinforcement across two phases in which (1) the two Phase I schedule components were equivalent, and (2) one of the Phase II schedule components was changed. The data for the experiment are the Flash Card and Oral Reading performance of S3. Correct rates and the means of those rates are reported.

S3 participated in this experiment after her participation in Subexperiment I-1. Tutors 1 and 2 were a female and a male respectively. Both Phase I Multiple schedule
components were VI 60 seconds L (VI60"L). Tutor 2 changed to a VR3H schedule in Phase II.

Results

Hypothesis 1 stated that the correct rates of the two Phase I components will be similar for Flash Card and Oral Reading performances. The null hypothesis, the median of the differences is not zero, will be tested by the sign test. Flash Card and Oral Reading results are discussed separately.

Table 5 shows the Flash Card Phase I data points and the direction of the difference between the matched pairs. For the data in Table 2, \( x \) equals the number of matched pairs who showed differences which equals ten. For \( N \) equals 10, an \( x \) less than or equal to 1 has a two-tailed probability of occurrence under the null hypothesis of \( p = .022 \). This value is in the region of rejection for \( p = .05 \); therefore, the alternative hypothesis, that there is a significant difference between the correct rates of the two Flash Card components is accepted.

Table 6 shows the Phase I Oral Reading data points and the direction of the difference between the matched pairs. For the data in Table 3, \( x \) equals the number of fewer signs which equals 3, and \( N \) equals the number of matched pairs who showed differences which equals ten. For \( N \) equals 10, an \( x \) less than or equal to 3 has a two-tailed probability of occurrence under the null hypothesis of
p = .344. This value is in the region of rejection for p = .05; therefore, the null hypothesis is rejected and the alternative hypothesis, that there is a significant difference between the correct rates of the two Flash Card components is accepted.

Hypothesis 2 stated that the Phase II mean VR rate will be higher than the Phase II mean VI rate for Flash Card and Oral Reading performance. Flash Card and Oral Reading data are discussed separately.

The Flash Card data of S3 shown in Table 7 indicates that the Phase II mean VR rate was 7.82 and mean VI rate was 9.86. These data show that the mean VR rate was lower than the mean VI rate. Therefore, Hypothesis 2 is rejected for the Flash Card performance.

Oral Reading results as displayed in Table 7 show that the Phase II mean VR rate was 30.13 and mean VI rate was 32.86. These data demonstrate that the mean VR rate was lower than the mean VI rate; therefore, Hypothesis 2 is rejected for the Oral Reading performance.

Hypothesis 3 stated that the Phase II mean VR rate will be higher than the mean VI rate for that tutor (Tutor 2) in Phase I. Flash Card and Oral Reading are discussed separately.

According to the Flash Card data presented in Table 7 the Tutor 2 mean VR rate was 7.82 and mean VI rate was 5.09. This indicates that the mean VR rate was higher than the mean VI rate. Therefore, Hypothesis 3 is accepted for the Flash Card performance.
Table 5. Data Points and the Direction of Differences Between the Matched Pairs for the Phase I Flash Card Performance in EXPERIMENT II

<table>
<thead>
<tr>
<th>Tutor 1</th>
<th>Tutor 2</th>
<th>Direction of Differences</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>9.5</td>
<td>6.8</td>
</tr>
<tr>
<td>2</td>
<td>13.0</td>
<td>3.0</td>
</tr>
<tr>
<td>3</td>
<td>8.4</td>
<td>6.2</td>
</tr>
<tr>
<td>4</td>
<td>11.3</td>
<td>4.6</td>
</tr>
<tr>
<td>5</td>
<td>13.8</td>
<td>3.6</td>
</tr>
<tr>
<td>6</td>
<td>17.2</td>
<td>8.3</td>
</tr>
<tr>
<td>7</td>
<td>10.4</td>
<td>6.0</td>
</tr>
<tr>
<td>8</td>
<td>12.0</td>
<td>5.5</td>
</tr>
<tr>
<td>9</td>
<td>6.7</td>
<td>9.6</td>
</tr>
<tr>
<td>10</td>
<td>12.8</td>
<td>8.8</td>
</tr>
</tbody>
</table>
Table 6. Data Points and the Direction of Differences Between the Matched Pairs for the Phase I Oral Reading Performance in EXPERIMENT II

<table>
<thead>
<tr>
<th></th>
<th>Tutor 1</th>
<th>Tutor 2</th>
<th>Direction of Differences</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>39.5</td>
<td>39.1</td>
<td>+</td>
</tr>
<tr>
<td>2</td>
<td>56.0</td>
<td>18.0</td>
<td>+</td>
</tr>
<tr>
<td>3</td>
<td>33.0</td>
<td>38.0</td>
<td>-</td>
</tr>
<tr>
<td>4</td>
<td>28.0</td>
<td>26.2</td>
<td>+</td>
</tr>
<tr>
<td>5</td>
<td>31.0</td>
<td>32.5</td>
<td>-</td>
</tr>
<tr>
<td>6</td>
<td>38.5</td>
<td>28.6</td>
<td>+</td>
</tr>
<tr>
<td>7</td>
<td>40.8</td>
<td>29.0</td>
<td>+</td>
</tr>
<tr>
<td>8</td>
<td>31.7</td>
<td>23.0</td>
<td>+</td>
</tr>
<tr>
<td>9</td>
<td>30.3</td>
<td>26.3</td>
<td>+</td>
</tr>
<tr>
<td>10</td>
<td>29.2</td>
<td>34.6</td>
<td>-</td>
</tr>
</tbody>
</table>
Table 7. Mean Rates of Correct Responses in
EXPERIMENT II

<table>
<thead>
<tr>
<th></th>
<th>Phase I (Tutor 1)</th>
<th>Phase I (Tutor 2)</th>
<th>Phase II (Tutor 1)</th>
<th>Phase II (Tutor 2)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>VI</td>
<td>VI</td>
<td>VI</td>
<td>VR</td>
</tr>
<tr>
<td>Flash Card</td>
<td>11.72</td>
<td>5.09</td>
<td>9.86</td>
<td>7.82</td>
</tr>
<tr>
<td>Reading</td>
<td>36.51</td>
<td>29.43</td>
<td>32.86</td>
<td>30.13</td>
</tr>
</tbody>
</table>
The Oral Reading data shown in Table 7 reveals the following: the Tutor 2 mean VR rate was 30.13 and mean VI rate was 29.43. These data indicate that the mean VR rate was higher than the mean VI rate. Therefore, Hypothesis 3 is accepted for the Oral Reading performance.

Hypothesis 4 stated that the Phase I mean VI rate for the unchanged tutor (Tutor 1) will be higher than the mean VI rate for that tutor in Phase II. Flash Card and Oral Reading will be discussed separately.

The Flash Card data (Table 7) for Tutor 1 revealed the following: in Phase I the mean VI rate was 11.72 and in Phase II the mean VI rate was 9.86. These data show a decrease in Tutor 1's mean VI rate from Phase I to Phase II; therefore, Hypothesis 4 is accepted for the Flash Card performance.

Table 7 shows the Oral Reading performance. Tutor 1 Phase I mean VI rate was 36.51 and the Phase II mean VI rate was 32.86. These data also represent a decrease in mean rate from Phase I to Phase II; therefore, Hypothesis 4 is accepted for the Oral Reading performance.

**Summary of Experiment II Results**

Experiment II examined Multiple schedules of social reinforcement and used a contrast design to demonstrate the effects. These results are summarized as follows:

(1) Hypothesis 1 was rejected, (2) Hypothesis 2 was rejected, (3) Hypothesis 3 was accepted, and (4) Hypothesis 4 was
accepted. Although there was a significant difference between the correct rates in Phase I, the introduction of the VR component in Phase II increased the mean rate for the changed tutor and decreased the mean rate for the unchanged tutor. An interpretive analysis of these results will be presented in Chapter V.

**Experiment III**

Experiment III examined Multiple schedules of social reinforcement in which at least one of the two components manipulated error responses. Two subexperiments were each comprised of two experimental phases. Schedule components across phases of each subexperiment were identical. The components assigned to tutors in Phase I were switched in Phase II. Correct and error rates and the means of those rates are reported since this experiment manipulated both correct and error responses.

**Subexperiment III-l**

S1, an eight-year-old female, participated in Subexperiment III-l. Multiple schedule components were FI 30 seconds L (RC) and FI 30 seconds C (RE). Tutors reinforced responses at the same frequency; one reinforced correct responses and the other reinforced error responses. Tutor 1, a female, reinforced correct responses and Tutor 2, a female, reinforced error responses in Phase I. The tutors switched components in Phase II; therefore,
Tutor 1 reinforced error responses and Tutor 2 reinforced correct responses in Phase II.

Results

Hypothesis 1 stated that the Flash Card mean correct rates in the RC component will be higher than the mean correct rate of the RE component in Phase I and in Phase II of the Flash Card performance. Table 8 shows the correct and error rates and the means of those rates for the Flash Card performance of S1. The Phase I mean RC rate was 8.03 and the mean RE rate was 6.37. These data show that the mean RC rate was higher than the mean RE rate. The Phase II mean correct rate for the RC was 6.03 and for the RE was 5.32. These data show that the mean RC rate was higher than the mean RE rate. The results from Phase I and Phase II support the acceptance of Hypothesis 1.

Hypothesis 2 stated that the Flash Card mean error rates in the RE component will be higher than the mean error rates of the RC component in Phase I and in Phase II. Table 8 provides the data for this Hypothesis. The Phase I mean RE rate was 2.80 and the mean RC rate was 1.35. These data show that the mean RE rate was higher than the mean RC rate. The Phase II mean RE rate was 2.04 and the mean RC rate was 3.02. These data show that the mean RE rate was lower than the mean RC rate in Phase II. Since only the Phase I results were in the expected direction, Hypothesis 2 is rejected.
Table 8. Mean Rates of Correct and Error Responses in EXPERIMENT III

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<td>RE</td>
<td>RC</td>
<td>RE</td>
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<td></td>
<td>Error</td>
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<td>2.12</td>
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Hypothesis 3 stated that the Oral Reading mean correct rates in the RC component will be higher than the mean correct rates of the RE component in Phase I and in Phase II. Table 8 shows the correct and error rates and the means of those rates for the Oral Reading performance of S1. The Phase I mean RC rate was 41.3 and the mean RE rate was 39.96. These data show that the mean RC rate was higher than the mean RE rate in Phase I. The Phase II mean correct rate for the RC was 34.63 and for the RE was 42.55. These data show that the mean RC rate was lower in Phase II than was the mean RE rate. Since only the Phase I results were in the expected direction, Hypothesis 3 is rejected.

Hypothesis 4 stated that the Oral Reading mean error rates in the RE component will be higher than the mean error rates of the RC component in Phase I and in Phase II. Table 8 provides the data for this hypothesis. The Phase I mean RE rate was 3.07 and the mean RC rate was 0.77. These data show that the mean RE rate was higher than the mean RC rate in Phase I. The Phase II mean RE rate was 2.03 and the mean RE rate was 2.19. These data show that the mean RE rate was lower than the mean RC in Phase II. Since only the Phase I results were in the expected direction, Hypothesis 4 is rejected.
Subexperiment III-2

S2, an eight-year-old male, served as the subject in Subexperiment III-2. The components of the Multiple schedule were a VI 60 seconds L (RC) and a VI 60 seconds D (RE). Tutors 1 and 2, a female and a male switched schedules from Phase I to Phase II.

Results

Hypothesis 5 stated that the Flash Card Phase I and Phase II mean correct rates will be higher in the RC component than in the RE component. Table 8 shows the correct and error rates and the means of those rates for the Flash Card performance of S2. In Phase I the mean RC correct rate was 4.93 and the mean RE correct rate was 4.52. The RC mean correct was, therefore, higher than the RE mean correct in Phase I. In Phase II the mean RC rate was 2.46 and the mean RE rate was 3.10. These data show that the mean RC rate was lower than the mean RE rate in Phase II. Therefore, since only the Phase I results were in the expected direction, Hypothesis 5 is rejected.

Hypothesis 6 stated that the Flash Card Phase I and Phase II mean error rates will be higher in the RE component than in the RC component. Table 8 provides the data for this hypothesis to be tested. In Phase I the RE mean error rate was 2.31 and the RC mean error rate was 1.53. These data show that the RE mean error rate was higher than the RC mean error rate in Phase I.
In Phase II the RE mean error rate was 1.88 and the RC mean error rate was 2.01. These data show that the RE mean error rate was lower than the RC mean error rate in Phase II. Since only the Phase I results were in the expected direction, Hypothesis 6 is rejected.

Hypothesis 7 stated that the Oral Reading Phase I and Phase II mean correct rates will be higher in the RC component than in the RE component. Table 8 shows the correct and error rates and the means of those rates for the Oral Reading performance of S2. The Phase I data reveals that the mean RC rate was 17.66 and the mean RE rate was 17.81. Thus, the mean RC rate was lower than the mean RE rate which was not expected. In Phase II the mean RC rate was 15.51 and the mean RE rate was 16.26. These results are not in the expected direction. That is, the mean RC rate was not higher than the mean RE rate in Phase II. Therefore, Hypothesis 7 is rejected.

Hypothesis 8 stated that the Oral Reading Phase I and Phase II mean error rates will be higher in the RE component than in the RC component. Table 8 provides the data for this hypothesis. In Phase I the mean RE error rate was 2.08 and the mean RC error rate was 1.78. These results were in the expected direction. However, the Phase II results were not in the expected direction. The mean RE error rate as 1.05 was not higher than the mean
RC error rate which was 2.08. Therefore, since the results of both phases were not in the expected direction, Hypothesis 8 is rejected.

Summary of Experiment III Results

Experiment III examined the effects of Multiple schedules of social reinforcement in which one of the two components reinforced correct responses and the other reinforced error responses. Although all eight hypotheses were rejected, there was remarkable consistency among the results. Whereas Phase I results for each hypothesis were in the expected direction, Phase II results were not in the expected direction. These interesting results will be discussed in Chapter V.
CHAPTER V
SUMMARY AND DISCUSSION

Experiments I, II, and III attempted to determine whether there was a predictable relationship between the Multiple schedule of social reinforcement and the subject's mean rate of responses. This chapter discusses these results and the similarities and differences between them and other investigations.

The results of the three experiments suggested that while the experimental manipulations did not produce data in the expected direction overall, there was remarkable consistency among the results. This consistency has important implications for future investigations of social reinforcement schedules. The chapter concludes with a discussion of those implications.

Briefly, the following was found: (1) Experiment I demonstrated differential responding to Multiple schedule components during Phase I. Generally the schedule which generated higher mean rates in Phase I produced higher mean rates in Phase II; (2) Experiment II's design contrasted the differential effects of changing one tutor's reinforcement frequency on rates of reading and the effect of that change on the rate of response to the unchanged tutor; (3) Experiment III demonstrated the irreversibility
of response from Phase I to Phase II when at least one of the tutors consequated error responding.

Experiment I demonstrated differential responding to Multiple schedules of social reinforcement. Although the data did not replicate previous research, the consistency of the data suggests that response rate was under the control of the schedule.

The Multiple schedules used in the three subexperiments each included a VR schedule and an FI schedule as the two components. Flash Card and Oral Reading mean response rates generally followed a consistent pattern in each subexperiment. Of the Flash Card and Oral Reading performances which changed, four unexpectedly generated higher rates in the FI component than in the VR component. In the fifth instance, the Flash Card performance of S4 in Subexperiment I-2, the VR component showed a higher mean rate in both phases than did the FI component. In the last case, the Oral Reading performance of S3 in Subexperiment I-1, neither generated a consistently higher performance.

In general, then, Experiment I results showed that the VR with its higher reinforcement density, generated lower response rates than did the FI. These results are supported by the Gewirtz (1967) findings in the area of satiation and deprivation of social reinforcement. Gewirtz concluded that the effectiveness of an approval word varied inversely with the frequency of its occurrence prior to the reinforcement test.
Basic animal operant research reviewed briefly in Chapter I found that the VR schedule typically generated higher rates of responding than did the FI schedule (Ferster and Skinner, 1957). While the Experiment I results are inconsistent with that study's findings, the particular characteristics of the present investigation presented may have a replication of the Ferster and Skinner findings. In this study the timing device continued to operate during the delivery and "ingestion" of the social reinforcement. In the cited research, the delivery of reinforcement was controlled mechanically. During reinforcement delivery, the timing device shut down; therefore, the calculation of rate of response did not include the time used to deliver and ingest reinforcement.

A description of S3's behavior provides an example of how this procedural difference may have influenced the results. S3 who participated in Subexperiment I-1, reacted emotionally to each reinforcement which seemed to disrupt her attention to the materials. The higher frequency of reinforcement during the VR condition and the disruption induced may have lessened the overall time in which the subject had to respond. Thus, the calculation of rate may have been affected.

Staats, Finley, Minke, and Wolf (1964) demonstrated results with Multiple schedules on human reading responses somewhat consistent with basic animal research. However,
Unlike the present study, the reinforcers were tokens, which allow greater control over response rate. Lovitt et al. (1971) found results contrary to the present findings as well. Using single ratio token schedules, these investigators generated differential oral reading performance to CRF/EXT and FR30/EXT. As with the Staats et al. (1964) study, schedule differences and the use of tokens may account for the contradictory results.

Racial factors may also explain these results. As discussed in the Literature Review, blacks and whites seem to be responsive to different sets of social reinforcers. In this regard perhaps the verbal statements selected as reinforcers served instead as negative reinforcers. The subjects may have responded at a slower rate on the VR schedule in order to avoid the occurrence of the verbal statement. It would be important in future research to rectify the procedural problem already alluded to in order to clarify this point.

Experiment II demonstrated the contrast effect of changing reinforcement frequency of one of two previously equivalent components. "The change in behavior is called a contrast when the change in the rate of responding during the presentation of one stimulus is in a direction away from the rate of responding generated during the presentation of the other stimulus" (Reynolds, 1961, p. 57). Phase I Multiple schedule components were VI60"L. Tutor 2 generated a lower Flash Card and Oral Reading Phase I mean correct rate and therefore was chosen to change to the VR3H schedule in Phase II. As
expected the introduction of the VR3H increased the correct rates in the changed component and lowered the correct rates in the unchanged VI component.

Waite and Osborne (1972) provided the first demonstration of behavioral contrast in children. Multiple schedules influencing a simple operant were VI/VI and VI/EXT. The current study supports their findings by producing this contrast effect with different Multiple schedules using a more complex response reading.

In contrast to the present experiment, Waite and Osborne (1972) found equivalent rates during the VI/VI schedule. Phase I rates were not equivalent in the present study. Because of this lack of equivalent rates, the tutor with the lower mean rate was chosen to change schedules. The results are not weakened by the lack of equivalent rates in the first phase.

Experiments I and II as a unit demonstrated the influence of social reinforcement on Flash Card and Oral Reading responses. Social reinforcement schedules were shown to be the controlling variable. Certain factors in this study may have enhanced this outcome. First, the use of different tutors to serve as component stimuli may have hastened the discrimination between schedules. Second, the control over the rate of progress stabilized the effect of the "learning-to-learn" phenomena. This allowed the response to fluctuate with the experimental manipulations. Third, point delivery
was standard. The present study suggests that social reinforcement, a more naturally occurring reinforcer than a point or token, has a significant effect on a relevant educational behavior.

Contrary to the results of Experiments I and II which showed schedule control, Experiment III did not demonstrate such control. Schedule effects in Phase I of the subexperiments were not maintained in Phase II when the tutors switched schedules. Thus, the tutor effect appeared to exert more influence over the results than did the schedules. This may have been due to the nature of the response being consequated. In this experiment, at least one of the two Multiple schedule components consequated error responses.

It is unclear, however, whether the type of reinforcement, the conseuation of errors, or the sequence of treatments was more important in influencing these results. Each subexperiment had equivalent schedules in terms of the schedule specification. That is, both schedules of Subexperiment III-1 were FI30" and those in III-2 were VI60". One component in each consequated correct responses and one consequated error responses. The conseuation of error responses by one tutor in Phase I may have induced an emotional reaction which could have exerted more control over the responses in Phase II than the schedule. For these reasons, caution must be taken in drawing conclusions from Experiment III.
Experiment III's irreversible results contradict the findings of several other studies. Sajwaj and Knight (1971) found, for example, that errors consistently increased if more attention was given them than corrects. Hasazi and Hasazi (1972) found that removing attention for digit-reversals significantly reduced errors. These investigations sought to eliminate errors and no reversal was attempted; whereas the current one attempted to bring errors under control of the schedule.

The results of two informational reinforcement studies (Buchwald, 1959; Spence and Dunton, 1967) also differ with Experiment III's lack of results. In comparing the effectiveness of Rb, RW, and Wb, Rb was found to be inferior. Therefore, one would assume that the Wb conditions in Experiment III would yield consistently superior rates. That they did not may, of course, reflect the design of the current study and the sequence of treatments which was much different from the group design and CRF application of reinforcement in the informational studies.

An analysis of the results of Experiments I, II, and III leads one to conclude that Multiple schedules of social reinforcement were shown to demonstrate differential effects on reading behavior particularly when reinforcement was contingent upon correct responses. When schedules of reinforcement were applied to error responses, the interpretation of the results was unclear. Emotional responses to the tutors, as the sequencing interpretation would suggest, may influence
the results. It must also be made clear that although differential responding resulted from the use of Multiple schedules, the results are confounded by the inclusion of different types of social reinforcement within the Multiple schedules. The study demonstrated differential responding to social reinforcement in a single subject design. Future research to clarify these results or to simply look directly at schedules of social reinforcement would be useful.

The conclusion, then, that social reinforcement was the controlling variable influencing subject responsiveness suggests that researchers attempt the control of complex human behavior with more naturally occurring reinforcers. The present research does not deny the contention that social reinforcement plus tokens may be more effective than social reinforcement alone (Lahey and Drabman, 1974; Staats et al., 1962; Chadwick and Day, 1971). Rather, this study simply suggests that social reinforcement alone can influence a child's reading.

The methodology in this study could be useful in future research on the teaching of reading. In order to demonstrate control by social reinforcement, many aspects of the tutor-subject interaction had to be standardized. The standardization provides a useful base from which the researcher or teacher could give structured input and observe its effects. Instructed to ignore inappropriate behaviors, such as errors, and to attend to appropriate or on-task behaviors such as correct
responses, researchers and teachers can reliably observe the influence of the experimental manipulation of social reinforcement.

Standardization of material presentation and of the rate of progress through the curriculum contributes more control procedures by which researchers and teachers could observe the effect of varying curriculum factors. Standardization of the variables in such a complex situation as a remedial reading tutorial interaction is critical to understanding and controlling the influence of idiosyncratic subject behaviors which impede progress. If procedures are standardized, such that behavior is not fluctuating due to an inconsistent environment, the experimenter or teacher can design additional procedures unique to each subject to facilitate learning.

This study provides the first demonstration of the reversibility of social reinforcement effects on reading behavior. Several studies had shown the differential control of reading behavior by various token manipulations (Staats et al., 1964; Lovitt et al., 1971) but none had attempted to control reading behavior with social reinforcement. Moreover, some researchers had assumed social reinforcement to be a fruitless variable to investigate with respect to reading behavior or academic behavior (Lahey and Drabman, 1974; Staats et al., 1962; Chadwick and Day, 1971). Comparatively, social reinforcement may be inferior to token reinforcement but its availability and societal acceptance makes it imperative that it not be denied
as a research tool. Researchers questioned the viability of using social reinforcement and turned to token reinforcement as a more manageable research tool.

Furthermore, historically social reinforcement research tended to control subservient behaviors (Thomas, Nielsen, Kuypers, and Becker, 1968) or irrelevant human behaviors, such as rate of placing marbles in holes (Panda, 1972). The results of the present research, however, suggest that factors of social interaction can be specified in order that social reinforcement can be discreetly delivered within so complexly defined a setting as remedial reading. In other words, social reinforcement effects can be investigated in relation to complex human learning.

The utilization of the Performance Determined Instruction model (Gray et al., 1969) stabilized the "learning-to-learn" phenomenon. This allowed the behavior to fluctuate as a result of the manipulation of experimental variables. The stabilization of accuracy within the 90 to 95 percent accuracy level ties in with J. McVicker Hunt's theory of the match necessary between the curriculum and the child to promote intellectual accommodation (Hunt, 1964). The influence of emotional responses of boredom or frustration from too high or too low an accuracy level was controlled by the use of the PDI system.
Critical reviews of past social reinforcement research suggested the need for functional designs (Van de Riet, 1963; Kennedy and Willcutt, 1964). The reversal and contrast designs of the present study controlled reinforcement history, the influence of characteristics of the subject, and the influence of characteristics of the tutors. Therefore, these results support the use of functional designs in social reinforcement research.

An important area of research is opened by the current project. An analysis of the variables controlling error responding seems warranted. It remains of interest whether a reading error response is analogous to an inappropriate social behavior in terms of the controlling variables. The present research suggests the need for more extensive analysis of the factors which influence error response rate. For instance, one could systematically replicate Experiment III using a Multiple CRF/EXT schedule.

Methodologically, this study sustained implications for research, teaching, and the treatment of reading disorders. Basic research can be attempted in a school setting. Furthermore, the results suggest that basic research on relevant human behaviors can occur simultaneously with the provision of remedial training.

As social behavior has been reliably shown to be influenced by environmental consequences, the present study indicates that it influences reading behavior. The contrast between one teacher's style and another's may have a
significant effect on an individual child's performance. Likewise, teacher contrast can effect a child's emotional responses and preferences. Consider the junior high program in which a student might have five equally reinforcing or demanding teachers first semester. Second semester the math teacher is changed to either an extremely negative or highly reinforcing one. The possible concommitant effect on responding to math and to the other courses seems analogous to the present contrast findings.

The implications of the present research for the teaching of remedial reading are most promising. A training package can be developed based on the methodological decisions made for the current research. Instead of remediating specific skill deficiencies in hopes that there would be some generalization to overall reading strength, this project took a more radical view of the teaching of reading. The research assumed that if the child was placed at his 90 to 95 percent accuracy level in a programmed curriculum, the interaction between the tutor and the child would be critical to the child's strength as a reader. Not only was the interaction assumed to be important, but its dimensions were strictly specified. Random interactions were kept at a minimum. The control of social interaction with regard to both correct and error responses in remedial reading situations is important.
Summary

Reading behavior has been shown to be systematically effected by social reinforcement. It is unclear whether type of reinforcement or schedule of reinforcement was the controlling variable. Procedural limitations and the question of whether the verbal statements were in fact reinforcing may explain why the results were not in the expected direction. Analysis of error responding appears to be a fertile area for research. Basic research on complex human learning tasks seems viable within a public school setting. The small number of subjects limits the generalizability of these results, however, the clarity of the influence of social reinforcement seems to be a needed addition to the literature on the social reinforcement of reading. The methodology developed for this study to control tutor-subject interaction, rate of progress through a curriculum, and the delivery of social reinforcement has important implications for research, teaching, and the treatment of reading disorders.
APPENDIX A
POINT SHEET
## APPENDIX B
### DAILY DATA SHEET

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APPENDIX C

STANDARD BEHAVIOR CHARTS
Daily rates of correct and error responses for the Flash Card performance of S3 in Subexperiment I-1.
Daily rates of correct and error response for the Oral Reading performance of S3 in Subexperiment I-1.
Daily rates of correct and error responses for the Oral Reading performance of S4 in Subexperiment I-2.
Daily rates of correct and error responses for the Flash Card performance of S4 in Subexperiment I-3.
Daily rates of correct and error responses for the Oral Reading performance of S4 in Subexperiment I-3
Daily rates of correct and error responses for the Flash Card performance of S3 in Experiment II.
Daily rates of correct and error responses for the Oral Reading performance of S3 in Experiment II
Daily rates of correct and error responses for the Flash Card performance of S1 in Subexperiment III-L.
Daily rates of correct and error responses for the Oral Reading performance of S1 in Subexperiment III-1.
Daily rates of correct and error responses for the Flash Card performance of S2 in Subexperiment III-2
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<td>17.81</td>
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X = 1.78  2.08  2.12  1.05

Daily rates of correct and error responses for the Oral Reading performance of S2 in Subexperiment III-2.


Hoeltzel, R.C. Reading rates and comprehension as affected by single and multiple-ratio schedules of reinforcement within a token economy as measured by precision teaching techniques. (Doctoral dissertation, University Microfilms), 1973, No. 74-9066.


Pamela Phelan was born in Quincy, Massachusetts and raised in Plantation, Florida. She received her Bachelor of Arts in Psychology (June, 1970) and Master of Education (August, 1971) degrees from the University of Florida. Presently, she lives in Silver Spring, Maryland and is employed as a school psychologist with Montgomery County Public Schools in Rockville, Maryland.
I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

Donald Avila
Professor of Education

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

John Newell
Professor of Education

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

William Ware
Professor of Education
I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

Henry S. Pennypacker
Professor of Psychology

This dissertation was submitted to the Graduate Faculty of the College of Education and to the Graduate Council, and was accepted as partial fulfillment of the requirements for the degree of Doctor of Philosophy.

August, 1976

R. Sherman/Ala
Dean, College of Education

Dean, Graduate School