TEACHER IMPLEMENTATION OF A PRETREATMENT
ASSessment PROCEDURE IN A
PUBLIC MIDDLE SCHOOL

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In an attempt to determine the effectiveness of a pretreatment assessment procedure known as the scatter plot (Touchette, MacDonald, & Langer, 1985), direct observational data was collected by 13 middle school teachers on four "problem" students. After four weeks of data collection, interobserver agreement probes were calculated and a visual analysis of the plotted data was performed to ascertain a possible pattern of problem behavior. Additionally, in an attempt to assess the teachers' perceptions of the scatter plot, the 13 teachers were asked to complete a questionnaire. Although a visual analysis of the plotted data suggested a possible pattern of problem behavior, interobserver agreement probes failed to achieve a desired overall reliability of 90% or higher. Despite a low IOA, results of the questionnaire administered to the 13 teachers generally supported the use of the scatter plot as a means of assessing student behavior. Possible reasons for failing to attain an IOA of 90% or higher include the total number of students in a class, the number of subjects observed per period, the teacher's location in the classroom, and the
subjects ability to recognize if the teacher was "looking."
Recommendations are provided regarding future research
concerning the scatter plot and other more formal approaches
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CHAPTER I

INTRODUCTION

The purpose of this study was to ascertain if a pretreatment assessment procedure utilized primarily by practitioners working with special populations, could be effectively implemented and utilized by a group of 13 public middle school teachers in a North Texas suburb of Dallas. A "team" of teachers at the middle school identified classroom disturbances (ranging from noncompliance to minor physical confrontations) that were most commonly exhibited by seventh-grade students at this particular middle school. The 13 teachers were then trained to implement the pretreatment assessment procedure known as the scatter plot. Subsequently, the problem behaviors identified as most commonly occurring were observed and recorded by the teachers in an effort to learn and understand more about student discipline overall and, particularly, the behavior(s) being exhibited by four seventh-grade students identified by the team of teachers as being problems in the classroom.

A 1996 report by the National Education Association (NEA) indicated that approximately one-fifth (20.1%) of teachers stated they would probably not go into teaching if they had to decide again. This percentage is approximately
two times the percentage of teachers who exhibited the same sentiment in 1961, the year the report was first published. The major reason given for such a response: "discipline and negative student attitudes" (NEA, 1997).

Similar concerns about student discipline also appear to be reflected by the American public. The 1998 Phi Delta Kappa/Gallup Poll cited "lack of discipline/more control," as being among the biggest problems facing local schools. Lack of discipline was mentioned by 14% of those responding to the poll. Although five percentage points less than the 19% reported in 1988, lack of discipline continues to be ranked high on the list of problems facing local public schools (Rose and Gallup, 1998).

Concern over the public's attitudes toward student discipline has resulted in the study, development, and funding of a variety of discipline procedures. In addition to this, governing boards, administrative staff, and community members have developed policies and standards that provide teachers with the support needed to maintain a positive classroom environment. The public's increased awareness of this issue has also resulted in an emphasis on the role of teachers in managing student discipline.

Senate Bill 1, passed in 1995, required the Commissioner of Education to recommend an appraisal system for Texas teachers. Section 21.351 of the Texas Education Code (TEC) required that, in addition to other criteria, the
system was to include information on the teacher's implementation of discipline management procedures. With input from teachers and other professionals, the Professional Development and Appraisal System (PDAS), which incorporated the new Proficiencies for Learner-Centered Instruction adopted by the State Board of Education in 1994, was developed and implemented beginning with the 1997-1998 school year (Texas Education Agency). A goal of the PDAS was to develop a system that acknowledged and reinforced good teaching practices supported by research.

The PDAS, which is composed of eight independent domains containing 51 evaluation criteria, is used to evaluate each teacher via classroom observation and input from the Teacher Self-Report Form. The eight domains on which the teacher evaluation is based are:

Domain I: Active, successful student participation in the learning process;
Domain II: Learner-centered instruction;
Domain III: Evaluation and feedback on student progress;
Domain IV: Management of student discipline, instructional strategies, time, and materials;
Domain V: Professional communication;
Domain VI: Professional development;
Domain VII: Compliance with policies, operating procedures and requirements; and
Domain VIII: Improvement of academic performance of all students on the campus.

The search for an instrument to aid teachers in satisfying the elements of Domain IV of the PDAS led to an investigation of pretreatment assessment procedures, more commonly referred to as functional assessment/analysis. The objective of such procedures is to identify variables (causes) in the environment (classroom) responsible for maintaining problem behavior. The assessments have generally taken three forms: anecdotal, descriptive, and experimental.

Of the pretreatment assessment procedures investigated, a descriptive approach to assessing problem behavior known as the scatter plot (Touchette, MacDonald, and Langer, 1985) appeared to be most appropriate for this type of situation. The proposed use of this pretreatment assessment procedure as a tool to aid teachers in attaining the aforementioned objectives will guide this discussion. According to Touchette et al. (1985), the scatter plot, a descriptive pretreatment assessment procedure, is readily adaptable, to almost any setting (including schools). Although the scatter plot method of assessing behavior was initially developed in the context of residential programs for autistic children, subsequent investigations of the scatter plot appeared to confirm Touchette's assertion that the method was adaptable (Symons, 1992; Lalli, Browder, Mace, & Brown, 1993).
A pilot study (see Figure 1) was conducted at the middle school prior to initiating the present investigation, and results also appeared to support Touchette's assertion. Data were collected and recorded on a scatter plot for a period of seven school days by six of the student's eight teachers. These data indicated a pattern of behavior occurring after 12:00 p.m. Although the pilot study was only an introductory attempt to apply the scatter plot in this type of setting, implementation was relatively uncomplicated.

Implementation of the scatter plot begins with the construction of a grid that vertically segments the day into units of time and horizontally segments a school week into successive days. Teachers (observers) record occurrence(s) of pre-specified target behavior(s) exhibited by the student on the grid. A blank cell on the grid is usually indicative of a 0 rate of occurrence during a particular interval, whereas a filled/marked cell may be representative of one or more occurrences during the interval. Additional notations to indicate a low or high frequency of occurrence per interval can also be incorporated. After observing and recording over a period of successive days, the teacher is then able, through visual analysis, to determine if a pattern of behavior exists. It is the interpretation of these data that allows the teacher to hypothesize about possible sources of problem behavior. According to Touchette
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- : 3 or more occurrences per interval

- **ISS**: In-school suspension
- **SUS**: Student suspended
- **H**: Host (math tutoring)
- **A**: Student absent
- **S**: Teacher substitute
- **D**: Dean

**Figure 1.** Data collected for student during pilot study.
et al. (1985), identification and elimination of these possible sources of problem behavior not only to reductions in occurrences of problem behavior but also to increases in the occurrences of appropriate behavior. For example, if a teacher knew there was a high correlation between an assigned task and the occurrence of a problem behavior exhibited by a student, the teacher might choose to either modify or replace the task with one which is likely to result decrease the inappropriate behavior or increase in appropriate behavior.

As previously mentioned, there are three general forms of pretreatment assessment procedures. In addition to descriptive procedures like the scatter plot, there are two other forms: indirect procedures and experimental procedures.

Indirect procedures usually involve administering interview formats, checklists, and rating scales in an effort to solicit information about when problem behaviors are more or less likely to occur. Data are then analyzed to determine variables controlling the problem behavior. Because indirect procedures rely on subjective opinion or faulty memory, Iwata, Zarcone, Vollmer, and Smith (1994), Zarcone, Rodgers, Iwata, Rourke, and Dorsey (1991), and Durand and Crimmins (1988), recommend that use of these type instruments should be reserved for preliminary information-
gathering purposes only and not for the purpose of behavioral assessment.

When evaluating the effects of environmental variables on behavior, most investigators have utilized experimental methods based on the model of Iwata, Dorsey, Slifer, Bauman, and Richman (1985). Experimental assessments, ordinarily conducted under carefully controlled analogue conditions, generally consist of the direct manipulation of variables believed to maintain the problem behavior. In a school environment which often precludes removing the student from the classroom, experimental analyses may not be practical (Lalli, et al., 1993).

Unlike descriptive assessments (e.g., the scatter plot), which allow the researcher to observe the subject's (student) behaviors during situations that occur in a natural setting (classroom), experimental analysis procedures although effective do not allow for such observations. In a public school setting, arranging assessment conditions to allow for the systematic introduction and removal of suspected sources of problem behavior while observing the effects of these sources on the subject's behavior would prove difficult.

A majority of studies utilizing pretreatment assessment procedures have focused primarily on populations diagnosed with developmental delays, mental retardation, or autism. Moreover, within these populations, assessment methods have
been directed toward individuals who exhibit high rates of self-injurious behavior or stereotypy. Although researchers such as Touchette et al. (1985) recommend that a descriptive assessment like the scatter plot could be adapted to diverse settings including public school classrooms, a review of the literature found only two systematic attempts (Symons, 1992; Lalli et al., 1993) in which this particular type of pretreatment assessment technology had actually been applied in an educational setting. These studies are discussed in detail in the review of literature section of this paper.

The current study attempted to evaluate the potential role of the scatter plot as applied in educational settings by extending previous research. Results of the Symons (1992) study, a field study performed to further validate the scatter plot as a means of assessing behavior, indicated that for three of four behaviorally disordered special education elementary students, the scatter plot led to an intervention that produced a significant reduction in classroom problem behavior. However, additional evidence pertaining to the potentiality of implementing the scatter plot at the secondary level has yet to be collected and analyzed. The results of the present study, in which problem behaviors exhibited by four seventh-grade students were observed and recorded on a scatter plot by their teachers, should contribute to that evidence.
Statement of the Problem

This study was conducted to determine if a scatter plot could be reliably implemented by a group of middle school teachers and, if so, whether it could provide teachers a basis to formulate hypotheses concerning student problem behavior. The formulation of such hypotheses could then lead educators to the development and implementation of behavioral interventions. Unlike traditional interventions which often fail to examine the conditions in which the problem behavior of a student is likely to occur, interventions based on data collected via the scatter plot rely on an examination of these conditions prior to implementation.

Research Questions

The three research questions that formed the basis for this study are also presented:

1. Can a group of 13 middle school teachers reliably implement a scatter plot to observe and record the behavior of four seventh grade students identified as being "problems" in the classroom?

2. Will the plotted data display a pattern of behavior that is meaningful to the teacher?

3. How will the 13 teachers respond to this study?
Procedures for Collection and Analysis of Data

To further apply what several researchers (Touchette et al., 1985; Symons, 1992; Lalli, et al., 1993; Kahng, Iwata, Fischer, Page, Treadwell, Williams, and Smith, 1998) have recently discussed as an example of functional assessment methodology, the scatter plot was field-tested in several middle school classrooms. Analysis of the data was based upon information gathered by the teachers and a visual analysis of the scatter plot. A subsequent meeting with the teachers was then held in which possible sources responsible for the occurrence of problem behavior(s) were discussed. In addition to this discussion, a questionnaire was administered to all 13 teachers in an effort to gain further insight into the teachers' perceptions about the scatter plot and its effectiveness. This field test differed from previous studies by using a public middle school population in which none of the subjects had been diagnosed with developmental delays, mental retardation, autism, and/or behavioral disorders.

Definition of Terms

For the purposes of this study, the following definitions were used:

Pretreatment Analysis Procedures attempt to identify the role of positive and negative reinforcement in the maintenance of problem behaviors (Lalli, et al., 1993). In a
classroom, this may include the identification of the time of day, the presence of another student, an assigned task, or some other environmental event as being a contributing factor responsible for a student exhibiting problem behavior. After the factor(s) are identified, treatment to lessen the occurrence of problem behavior is implemented.

**Scatter Plot Method of Assessing Behavior** utilizes a grid that segments time of day vertically and successive days horizontally. Open, slashed, or filled boxes corresponding to response frequencies are recorded by the observer. The collected data are then analyzed visually to determine if a pattern of behavior exists.

**Middle Schools** as defined by the National Middle School Association, are mainly schools for students in grades 6 to 8, but can be for students in grades 5 to 8, grades 5 to 7, or grades 7 to 8. The school is designed to address the developmental needs (social and academic) of young adolescents and is organized by interdisciplinary teams. The organizational structure is flexible and varied teaching/learning approaches are utilized (NMSA, 1995).

**Core Teachers** as described in this study were those teachers responsible for teaching the core (basic) courses of math, science, reading, English, and history.

**Team** is the term used in this study to identify the five core teachers representing math, science, reading, English, and history. The teachers share students, a common
planning time, a common teaching schedule, and a common area of the school building.

**Classroom Environment** is the conglomerate of real circumstances that occur or exist in a particular room of the school building. In this study, each of the four observed students were required to attend eight classes per school day.

**Stimulus** is a general term used to describe any condition, event, or change in the physical world. A stimulus, which may be an antecedent or a consequence, is defined by Miller (1980) as any physical event, object, or change in the environment that is related to a person's behavior. These stimuli might be objects such as clothing, flowers, and other people; sounds such as music, screams, sighs; and visible configurations such as colors, lighting, and size. For example, in educational settings this may include the presence of another student, the sound of a bell, or a classroom activity.

**Reinforcement** is a contingency between a behavior and a consequence that results in an increase in some dimension of the behavior in the future. Rewarding students with a token for exhibiting appropriate behavior is an example of reinforcement often utilized in schools.

**Punishment** is a contingency between a behavior and a consequence that results in a decrease in some dimension of the behavior in the future. In educational settings,
punishment usually refers to the presentation of an aversive consequence as a result of inappropriate behavior (e.g., a detention, in-school suspension, or a visit to the dean).

Establishing Operation is defined as any operation that temporarily alters the effectiveness of an object or event as reinforcement for a given behavior (Iwata, et al., 1994).

Target Behaviors are the subject's specific behavior(s) identified for change (Cooper, Heron, & Eeward, 1987). In this study, the target behaviors were those identified by the researcher and the teachers as being incompatible with learning.

Limitations

Because a study conducted in this type of public school setting necessitates that the researcher possess an in-depth understanding of the particular educational environment as well as general theoretical insights about that environment, the researcher selected a middle school where he had been employed for approximately six years. This particular setting provided the researcher with easy access which was mediated by the principal and an already established rapport with the participants (teachers).

Selection of the core group of teacher participants was originally based upon their being part of a "team." Because only seventh-grade teachers at this particular school were assigned to teams, the researcher selected only participants who taught at this grade level. A subsequent meeting with
members of the first team interviewed by the researcher resulted in the teachers' agreeing to participate in the study.

After being informed about the purpose of the study, the teachers recommended seven students for observation. Because of the situational complexity in which teachers were required to observe and record student behavior while continuing to engage in their normal everyday teaching activities, the number of students (subjects) to be observed was limited to four.

After conducting a pilot study to determine the core teachers' ability to record the occurrence of inappropriate behavior(s) during the course of a normal school week, it was determined that a more thorough investigation into the scatter plot as a means of assessing student behavior was merited. It was believed that, by extending the study beyond the core teachers and attempting to have all the students' teachers collect data, a more accurate basis for identifying relations between temporal patterns of problem behavior and environmental variables (e.g., academic tasks, assignments, teacher(s), other student(s), etc.) would be established.

The present study, in which all of the subjects' teachers recorded data, was conducted for a duration of four school weeks. Situations beyond the researcher's control limited the length of the study and the possibility of implementing an intervention. Despite a recommendation by
the researcher during the fifth week to postpone the
ing the placement of two of the four students into a self-contained
disciplinary program, it was determined by the assistant
principal and the campus assessment team that immediate
placement into the already-existing program was necessary so
as to relieve the teachers of these problem students.

As is depicted in the scatter plots for each student in
Chapter 4 of this paper, many other factors also affected
data collection. These factors included, among others,
curricular programs, suspensions, visits to the dean,
teacher absences, and student absences.
CHAPTER II

REVIEW OF THE LITERATURE

The following review examines the basic foundations of pretreatment assessment procedures. The basic principles of behavior analysis, which serve as the groundwork on which to base pretreatment assessment procedures, are discussed along with factors that may contribute to the limited application of these behavioral principles in the classroom. This is followed by a discussion of the three general forms of pretreatment assessment procedures: indirect, experimental, and descriptive. Finally, a discussion of the scatter plot method, a descriptive pretreatment assessment procedure, and its possible application in a public middle school is presented.

Behavior Analysis

Early in the twentieth century, American psychologists began to develop a psychology that was oriented toward objective behavior and practical usefulness. Psychologists of the time, like behaviorists John B. Watson and Edward L. Thorndike, became interested in studying human behavior objectively. Other psychologists, like B. F. Skinner who resembles Watson and Thorndike in his practical emphasis, expanded the idea of behaviorism to include two kinds of learning - respondent and operant. According to Skinner, the
two are different because each involves a separate kind of behavior (Hill, 1977).

Respondent Behavior. Respondent behavior is elicited by specific stimuli; no learning is required. Once the stimulus is presented, the response occurs automatically. New stimuli can acquire the ability to elicit respondents; this type of learning follows the pattern known as classical conditioning which is associated with Russian physiologist Ivan Pavlov. A new stimulus is paired with a stimulus that already elicits the response and, after a number of such pairings the new stimulus comes to elicit the same response (Hill, 1977).

Operant Behavior. Most behaviors that are performed in everyday life are operants. Unlike respondent behavior, which is elicited by antecedent stimuli (in the sense of reflexive actions) operant behaviors are emitted and are controlled primarily by their consequences. The consequences, or effects of operant behavior on the environment, determine the future rate of the behavior's occurrence. Behaviors controllable by the consequences that follow them are referred to as operants because they operate on the environment and generate consequences (Skinner, 1953). Additionally, these consequences actually function to define the operant in terms of a given set of contextual conditions (Cooper, et al, 1987). This type of behavior enables a person to emit novel, complex responses to the
environment. These responses are defined in terms of their relationship to controlling variables.

A contingency, the complete description of a specific operant, refers to the interdependency it shares with other components. The three-term contingency of operant behavior, known as the ABCs of behavior analysis, consists of an antecedent, a response (behavior), and a consequence. Operant behavior is strengthened (increased) or weakened (decreased) as a function of the events that follow the behavior. The emitted behavior, known as a response, is the second term of the three-term contingency. Among the behavioral consequences or environmental changes that follow a response and alter the probability of future occurrences of the response are reinforcers and punishers.

**Positive Reinforcement.** The most basic principle of behavior is that of operant reinforcement. Positive reinforcement occurs when a behavior is followed by the presentation of a stimulus, resulting in an increase in the future probability of that behavior.

The importance of reinforcement in the classroom is evident in the results of the attention that a teacher gives a student. However, the results of that attention may not always be what is desired. Students may often "act up" in class to produce attention. Often, the teachers reprimand or lecture children about disruptive behavior. Such attention, although apparently unpleasant, may be reinforcing to a
child, especially in cases where the teacher otherwise pays little attention to that child. Positive reinforcement of this kind can lead to a variety of problem behavior on the part of the child.

In many situations, teachers will attend to a student only when he or she engages in disruptive behavior (e.g., starts yelling obscenities or talking back). In this type of situation, the teacher may attempt to distract the troublemaker. What the teacher may not take into account is that to distract the attention of a troublemaker may actually reinforce the student is doing when distracted—making trouble (Skinner, 1968). A teacher is often unaware of the reinforcing effects of his or her own behaviors. What appears to be punishment may be reinforcing; a student may misbehave to annoy the teacher or because he or she seeks the attention of classmates when being reprimanded.

The influence of the teacher's behavior in decreasing problem behavior in a regular classroom has been demonstrated in various studies. Becker, Madsen, Arnold, and Thomas (1967) demonstrated the effectiveness of teacher attention and praise in reducing the inappropriate classroom behavior of young children. Results of the study demonstrated that different types of teachers can learn to effectively apply behavioral principles to modify the behavior of problem students. Thomas, Becker, and Armstrong (1968) extended these techniques into the regular classroom.
and achieved similar outcomes. At the secondary level, McAllister, Stachowiak, Baer, and Conderman (1969) demonstrated that the combination of teacher approval and disapproval substantially reduced the incidence of inappropriate behavior in the classroom. Additionally, Hall, Lund, and Jackson (1968) were able to increase the study behavior of elementary students by systematically manipulating teacher attention.

In a study to determine how teacher behavior, particularly verbal reinforcement, operated to maintain or increase the school behavior of students, White (1975) investigated the naturalistic or existing rates of teacher approval and disapproval in Grades 1 through 12. Rates of teacher verbal reinforcement were obtained through the use of the Teacher Approval and Disapproval Observation Record (TAD) in which observers recorded all verbatim teacher approval and disapproval that followed a student behavior and which preceded the behavior. Total observation time was 8340 minutes, during which 104 teachers were observed.

For purposes of the analysis, the investigator divided the behavior into two categories: instructional (behavior related to the ongoing instructional activity) and managerial (behavior related to classroom management). In every grade, results indicated that the teacher approval rate for instructional behavior was higher than the teacher disapproval. The same could not be said for ratings
pertaining to managerial behavior. In this category, teacher response was predominantly disapproving with very little, if any, approving teacher response.

In another study on teacher behavior, Thomas, Presland, Grant, and Glynn (1978) recorded 7th grade students' on- and off-task behaviors and teachers' verbal responses contingent on the behavior. Teacher responses contingent on on-task behavior were designated as approving responses and those contingent on off-task behavior as disapproving responses. The on-task behaviors included the following:

1. No calling out: raise hand for permission to speak and leave seat.
2. Listen: not talking while the teacher is talking.
3. Remain seated and quiet while working.
4. If necessary to move around room, do so quietly.
5. When finished with assigned work, continue working on something else.

The off-task behaviors included the following:

1. Unnecessary noise: whistling, screaming, singing, etc.
2. Moving about room causing disruptions.
3. Daydreaming.

Results indicated that disapproval rates of 7 of the 10 teachers were triple the rate of approval behavior. The rates were similar to those reported by White (1975) and Heller and White (1975).
In their study to determine whether teachers' rates of verbal approval and disapproval varied with the ability level of a class, Heller and White (1975) found that the teachers who participated in their study almost never praised students for appropriate social behavior. Of the 1,105 EVRs (verbal expressions of approval/disapproval) recorded over 30 hours, only one of the teacher responses was a managerial approval. In this particular instance, the teacher remarked "Good" when a student stated he brought a pen to class that day.

Negative Reinforcement. Negative reinforcement occurs when a stimulus is withdrawn after the behavior has occurred, thus resulting in an increase of that behavior. Negatively reinforced behavior is maintained by escape from or avoidance of aversive events. For example, if an undesirable event (homework) is removed when a student demonstrates proper behavior, and if removal of the homework results in an increase in proper behavior, then negative reinforcement is being applied (Wolfgang and Glickman, 1986).

The child whose inappropriate behavior increases as a result of being removed from the classroom is another example of negative reinforcement. In this particular case, the child may behave inappropriately to escape from a situation (the classroom) that he or she may find aversive. Examples of such removal from the classroom environment
include time-out, in-school suspension, and out-of-school suspension.

Because "positive" events to control behavior can be highly effective, many behaviorists dream of building a world in which unpleasant events to control behavior are minimized (Miller, 1980). However, aversive control (the use of unpleasant events) appears to be another useful and necessary tool for behavioral change.

Punishment. Punishment is the process in which a stimulus is administered contingent on a behavior, resulting in a decrease in the future likelihood of that behavior. A punisher is an event that follows a behavior and decreases future occurrences of that behavior. Like reinforcers, there are two types of punishment. Type I punishment is characterized by the presentation of an aversive event upon a particular response. Being reprimanded for engaging in a certain behavior is a common example of Type I punishment. In many public schools, a common form of Type I punishment is a detention. For some, it is seen as a "quick fix" for minor violations of school regulations (e.g., arriving late to class, failing to do homework, etc.). As suggested by one principal, detention exists not for the student, but for the system; it is given merely to help students cooperate with the system (Cass, 1986).

A second type of punishment, Type II, is the withdrawal of a positive reinforcer after a response. Because most
educators feel that students truly want to be in school, suspension from school is often perceived as Type II punishment. Unlike a detention that serves as a "quick fix," a suspension is intended as a remedy for a student problem (Cass, 1986).

Discrimination Training. Whereas reinforcing stimuli follow behavior, other effective stimuli precede a behavior. A procedure that allows people to behave differently in one stimulus situation versus another is termed discrimination training. This occurs when a behavior is reinforced in the presence of a particular stimulus and extinguished in the presence of another stimulus. The stimulus associated with reinforcement is termed an SD, while the stimulus associated with extinction is termed an S-delta. Behavior that is more likely to occur after it has been preceded by an SD rather than an S-delta is known as discriminated behavior.

Extinction. A procedure in which a previously reinforced behavior is no longer reinforced is known as extinction. In this way the procedure reduces behaviors previously maintained by positive or negative reinforcement. An example of positive reinforcement being placed on extinction would be the withholding of a reinforcing stimulus as a consequence of the behavior.

A child who demands special attention from his parents every time he is left at school and responds with a temper tantrum when the special attention is not provided is an
example of a behavior being positively reinforced. Extinction occurs when the reinforcer is no longer provided (special attention) and the behavior (temper tantrums) gradually decreases over time. These types of undesirable behaviors, when placed on extinction, usually tend to get worse initially, prior to showing improvement (Cooper et al, 1987).

Establishing Operations. In the past, the influence of antecedent events on behavior has been described in relation to stimulus control. However, there are conditions under which altering the antecedents may result in a change in behavior without regard to consequences (Iwata, et al., 1994). Michael (1982) defines this concept as "any change in the environment which alters the effectiveness of some object or event as reinforcement and simultaneously alters the momentary frequency of the behavior that has been followed by that reinforcement." For example, for a student whose problem behavior is maintained by attention (positive reinforcement), the establishing operation is often some form of deprivation (e.g., from recess). The effects of establishing operations diminish when responding produces reinforcement (Iwata, et al, 1994).

For instance, a child's inappropriate classroom behavior may be a function of an inappropriate curriculum, that is, one that has assigned tasks that the child may find difficult to perform. In cases such as this, a more global
approach to identifying the controlling variables within the curriculum is needed (Symons, 1992). The identification and subsequent modification of the variables (antecedents) could result in a change in inappropriate classroom behavior.

The consideration of environmental factors such as this has perhaps been the most overlooked aspect of applied behavior analysis. Skinner (1953) proposed that significant human behavior might best be addressed using a pretreatment assessment approach. He argued that for one to better develop methods for establishing, increasing, limiting, decreasing, or generalizing a particular behavior, it was necessary to obtain knowledge about the reinforcement contingencies associated with the behavior (Vollmer & Smith, 1996).

Applied Behavioral Research

The extension of experimental investigations to human problems of social importance is termed applied research. Initially, applied research, like experimental analyses, tended to focus primarily on proximal antecedents and consequences, and their effects on behavior. However, rapid development in applied research over the past 20 years has led to an increasing number of studies that have focused on the development of different methods for identifying the sources of reinforcement in various settings. The application of these methods to socially significant human behavior has come to be referred to as applied behavior
analysis. While both basic and applied behavior analysts attempt to determine the variables that control human behavior, applied behavior analysts focus not only on understanding, but also on improving human behavior. Because of its complexity, human behavior has proved to be a major challenge for behavior analysts. This is especially true in applied settings where laboratory controls are impossible, impractical, or unethical (Cooper et al., 1987).

In educational settings in particular, studies provide empirical data supporting the effects of positive reinforcement in the classroom. The studies grew out of a body of laboratory and applied research that demonstrated the importance of social reinforcers in establishing and maintaining positive behaviors in children. Extensive studies in experimental nursery schools by Hart, Reynolds, Baer, Brawley, and Harris (1968); Allen, Hart, Buell, Harris, and Wolf (1965); and Bijou and Baer (1963) provided a background for the extension of their work to special and typical elementary school classrooms (Madsen, Becker, and Thomas, 1968).

In a study designed to emphasize the importance of contingencies between student and teacher behaviors Madsen, et al. (1968) refined an earlier study by Becker, et al, (1967). In the study, the behaviors of three children (two in one class and one in another class) were recorded by observers, as were samples of the teachers' behavior.
Following baseline recordings, Rules, Ignoring, and Approval conditions were introduced one at a time. The results indicated that Rules alone had only a small effect on decreasing classroom problem behaviors, that the combination of Ignoring Inappropriate Behavior and Approval for Appropriate Behavior was quite effective in attaining acceptable classroom behaviors, and that showing Approval for Appropriate Behaviors (positive control) was probably the key to effective classroom management.

The use of positive teacher reinforcement has proved to be an effective technique for dealing with student behavior. This is especially true in elementary and secondary schools where a teacher not only has the responsibility of teaching, but must maintain "order," as well. In this respect, the teacher not only serves as a source of knowledge but also serves as governor of the community (Skinner, 1968). Yet, according to Sulzer-Azaroff, 1986; Axelrod, 1992; Lindsley, 1992; and Fantuzzo and Atkins, 1992, a gap exists between what researchers have learned from studies pertaining to the effects of teacher behavior on student behavior and what educators have actually implemented.

Behavior-Analytic Strategies in Public Schools

B. F. Skinner (1984) often claimed that the findings from behavioral science could produce effective teaching practices. Unfortunately, teaching practices thus developed
are seldomly used by educators, despite claims that even a small number of behavioral procedures could revolutionize education (Sulzer-Azaroff, 1986 and Axelrod, 1992).

Several behavior analysts (Lindsley, 1992; Axelrod, 1992; and Fantuzzo & Atkins, 1992) have speculated on a number of factors that have impeded the use of behavioral techniques in the classroom. The factors include language and tradition, implementation issues, and university educational programs (Axelrod, 1992).

Because the terminology used by behavior analysts includes words like reinforcement, punishment, and consequences, behavior analysts are perceived by many in the American public as scientists who modify human behavior by utilizing strictly coercive and controlling techniques. The fact that these techniques were initially discovered in laboratories using animals as subjects appears only to fortify the people's misconceptions. Critics feel that behavioral teaching techniques stifle a child's creativity, whereas proponents feel that the practices are the only realistic way of teaching children to behave properly (Wolfgang & Glickman, 1986).

Despite the success behavior analysts have had in working with the disabled, the idea that these same principles can be applied to the general public is not fully accepted by educators (Axelrod, 1992). Many behavior-analytic studies in public schools have been conducted in
special education classrooms, and attempting to replicate these studies and their findings in regular classrooms may prove to be a difficult task. The conditions of special education classrooms and regular classrooms differ in various ways. Whereas special education classrooms tend to have fewer than ten students, regular classrooms often have more than twenty. Consequently, regular classroom teachers find it difficult to consistently administer consequences or withhold consequences. For example, in a class of twenty or more students in which two or more students may be displaying inappropriate/disruptive behavior, the behavior of the two students may be such that the teacher is forced to attend to, and not ignore, their behavior. The increased difficulty of ignoring (not reinforcing) inappropriate behavior while praising appropriate behavior is an example of how the number of students in a class can affect implementation of a simple behavioral technique.

The university training received by special education teachers versus regular education teachers is also a factor. Courses in behavior analysis are frequently offered and/or required for prospective special education teachers. However, teaching such courses requires skill development in an area with which most regular education faculty are unfamiliar and/or to which they are opposed (Axelrod, 1992).
Pretreatment Assessment Procedures

Over the past 20 years there has been an increasing amount of research on the development of methods for identifying sources of reinforcement for problem behaviors, particularly self-injurious behavior (SIB). Because no single form of treatment is expected to produce positive results in multiply controlled operants like SIB, researchers have begun to perform experimental investigations of the events currently maintaining the behavior (Iwata et. al, 1994).

This particular type of research commonly referred to as functional analysis, has provided a good foundation on which to construct identification and evaluation methods (Carr & Durand, 1985). The procedures represent a unique link between basic and applied research (Vollmer, Marcus, Ringdahl, & Roane, 1995). In addition to its clinical utility, pretreatment assessment analysis also serves as a form of basic research designed to discover more about why problem behavior occurs (Vollmer and Smith, 1996).

An effective pretreatment assessment procedure allows one to identify the following: antecedent conditions that are likely to cause the behavior; the source of reinforcement that, unless eliminated, will lead to recurrences of behavior in the future; and a procedural form of extinction to be incorporated into treatment that is likely to be effective (Iwata et al., 1994). And although
there are significant differences among procedures utilized to identify the motivational reasons for problem behavior, the procedures all have one thing in common: the attempt to identify the antecedent events or contexts that occasion the behavior and/or the consequent events that are serving as reinforcers (Iwata et al., 1994). Information gained through pretreatment assessment analysis allows for the development of treatment programs to alter antecedent or contextual events that occasion the behavior. The information can also aid in the identification of reinforcers contingent on alternative behavior (Lerman & Iwata, 1993). For example, if high rates of problem behavior are constantly correlated with a particular test condition, the antecedent and consequent events are considered to be functionally related to the behavior (Vollmer et al., 1995).

A growing emphasis on the use of pretreatment assessment procedures has resulted in a proliferation of methodologies for identifying variables associated with the occurrence or nonoccurrence of problem behavior such as SIB, aggression, and disruption (Lerman & Iwata, 1993). This has led to the emergence of three general approaches to conducting a pretreatment assessment. Each differs in terms of the type of data collected and the degree to which events in the environment are either observed or manipulated. The three general approaches consist of indirect analyses, descriptive analyses, and experimental analyses.
Indirect Assessments. In an effort to solicit information about when behavior problems are more or less likely to occur, interview formats, checklists, and rating scales have been developed. The various procedures range from open-ended questionnaires to more structured designs (Iwata et al., 1994). One such approach, the MAS (Motivational Assessment Scale), developed by Durand and Crimmins (1988) after extensive informal interviews with clinicians, parents, and teachers of developmentally disabled children, was presented as an alternative or adjunct to experimental analysis.

The MAS consists of 16 questions, which represent four examples of maintaining variables - escape, attention, tangible, and sensory consequences. For example, the question "Does this behavior occur when you are talking to other persons in the room?" assesses the role of social attention. Raters are instructed to answer questions on a seven-point Likert-type scale - never (0), almost never (1), seldom (2), half the time(3), usually (4), almost always (5), always (6). Overall scores are obtained by adding the scores for each of the four categories and computing a mean. A high score in one of the four categories indicates that this variable may be responsible in maintaining problem behavior.

In the Durand and Crimmins study (1988), 50 developmentally-disabled children with frequent self-
injurious behavior served as subjects. The subjects ranged in age from 3 years 1 month to 18 years 10 months. Estimates of intellectual functioning placed all subjects in the moderate to profound range of retardation. Self-injurious behaviors included face hitting, hand biting, and/or head hitting. The MAS data for the 50 subjects indicated that the most frequently cited motivation was tangible consequences (48%), followed by escape (18%), attention (17%), and sensory (17%).

In a second study to assess the validity of the MAS, eight developmentally disabled children who participated in the first study served as subjects. Five experimental (analog) conditions were constructed in an effort to determine variables that were presumed to be responsible for maintaining the self-injurious behavior. The conditions observed included baseline, attention, escape, tangible, and unstructured.

Baseline sessions consisted of subjects performing an easy match-to-sample task in which the subjects were provided with one-to-one attention in the form of praise. It was believed that socially maintained problem behaviors would be low in this condition because of the subjects’ access to a variety of reinforcers.

In the Attention condition, attention (commands, praise, and comments) was reduced from 100% of the intervals to about 33% of the intervals. Only one out of every three
intervals involved either a command, praise, or comment. Researchers expected that if the problem behaviors were being maintained by attention, the behaviors would increase during this condition.

The Escape condition was identical to the Baseline condition except that the subjects' were presented with a difficult task as opposed to an easy task. It was anticipated that behaviors maintained by negative reinforcement would increase during the Escape condition.

The Tangible condition consisted of making visible each of the subject's favorite tangibles. The tangibles were only made available to the subject for approximately every ninth correct answer. It was expected that those behaviors maintained by tangibles would increase during this condition.

During the Unstructured condition, all tangibles were within the subject's reach and placed on the desk if the subject chose to work. Also in this condition, an adult was present and would interact verbally or nonverbally, if solicited. Researchers expected that sensory maintained behaviors would be highest in the Unstructured condition.

Analog data collected in the second study were then correlated with the ranks of the MAS. The researchers found the correlation to be highly significant ($r = .99, < .001$). According to the researchers, the MAS ratings predicted the results of the analog study.
In a follow-up study to systematically replicate the reliability analysis of the MAS, Zarcone, Rodgers, Iwata, Rourke, and Dorsey (1991) failed to replicate the findings. The inability to replicate the findings led the researchers to conclude that verbal reports of past occurrences of problem behavior fail to properly identify the functions of the behavior as well as data collected through direct observation (Zarcone et al., 1991). The researchers concluded that because the questions did not refer to any specific event(s), they appeared to be subjective. Problems with reliability of the instrument develop as a result of the rater making conclusions based upon his or her ability to recall past observations. Concerns about the rater's familiarity with the subject and the rater's training immediately arise (Zarcone et al., 1991). The simplicity and efficiency of anecdotal methods like the MAS appear to be outweighed by their reliance on subjective opinion or faulty memory (Iwata et al., 1994).

**Experimental Analysis.** Unlike indirect analyses which rely heavily on opinion or memory, experimental analyses manipulate hypothesized variables under well-controlled analogue conditions. In these analyses, assessment conditions are arranged to allow for the systematic introduction and removal of antecedent stimuli. Conclusions are then inferred based upon the pattern of responses (Mace & Lalli, 1991). Two general methods for conducting
experimental analyses have been developed (Iwata et al., 1994).

One method examines the effects of a single variable whose influence on the behavior is suspected, whereas the second method examines the effects of more than one variable using either a multielement or reversal design. In both methods, the subject is exposed to at least one test condition in which the suspected variable is present and another in which it is absent (Iwata et al., 1994). The antecedents and/or consequences of each assessment condition are arranged such that high rates of the target behavior are indicative of a particular functional property of the behavior (Durand & Crimmins, 1988; Iwata et al., 1982). Results obtained from this type of experimentation usually reveal an orderly relationship between particular environmental events and the behavior of interest. After the environmental events have been identified, an intervention can be developed to eliminate or reverse the process by which the behavior is strengthened (Iwata et al., 1994).

Until recently, most investigations designed to analyze the function of problem behavior have used experimental analysis because of its objectivity and quantitative precision. When compared to other methods of assessment, experimental analysis has proved to be most effective in identifying causal relationships. Validity and utility of experimental analysis have been established for SIB,
stereotypy, aggression, and disruption (Lerman & Iwata, 1993). Yet there is concern about the ecological validity or generalizability of experimental functional analysis because causal relationships are demonstrated in analog situations (Taylor & Romanczyk, 1994). Because strict control must be exercised when performing an experimental analysis, the analysis may not reveal all the contextual events associated with the problem behavior in the natural environment (Iwata, Vollmer, & Zarcone, 1990). It cannot be assumed that the contingency maintaining a behavior under experimental conditions is identical to that which maintains the behavior in the natural environment (Sasso, Reimers, et al., 1992). And although the use of experimental analysis is highly recommended, the lack thereof is often due to concern that generalization will not occur. Experimental analysis is only valid to the extent that maintaining variables in analog environment match those in the natural environment (Taylor & Romanczyk, 1994).

Drawbacks to constructing analog situations appear to be the extensive staff training required and the amount of time necessary to conduct a proper assessment. For example, prior to developing an intervention for an individual, several observation sessions may be needed. Because of practical limitations, clinicians and practitioners may not be able to conduct extensive and thorough analysis prior to treatment (Vollmer et al., 1995). The previously stated
reasons, along with the fact that it is difficult to identify and directly manipulate all suspected variables responsible for a behavior in its natural environment, have led to the development of other methods of analysis.

When problems such as those stated above make it impractical to perform an experimental analysis, other methods should be considered. Given the choice between anecdotal methods of analysis or descriptive methods of analysis, Lerman and Iwata (1993) suggest descriptive methods as the most viable alternative to functional analysis.

**Descriptive Analysis.** Descriptive analysis represents an alternative approach for assessing the function of a behavior. The method assesses behavior-environment interactions based on observations in the natural settings in which the problem behavior occurs, without manipulating the suspected variables responsible for stimulating the problem behavior (Mace & Lalli, 1991). After the observations are made, inferences about maintaining variables can be made based upon correlations between the target behavior and specific events (Iwata et al, 1994). The data resulting from a descriptive analysis are by nature correlational, rather than experimental, and can only suggest a functional relationship operating in the subject's natural environment. Yet the resulting data can narrow the
scope of plausible hypotheses for future testing via experimental analysis (Mace & Lalli, 1991).

Lerman and Iwata (1993) discussed three general classes of descriptive analysis. The simplest approach, introduced by Touchette, et al., (1985), is the scatter plot. Observers using this approach record instances of the target behavior within a time interval to determine the presence of any distributional pattern of behavior across time of day. If a pattern appears to exist, structural elements of the subject's daily schedule are then modified as a means to lower the occurrence of problem behavior. While this approach is able to detect environmental conditions related to behavior, it contains no provision for identifying specific antecedent and consequent events (Lerman & Iwata, 1993). A second approach, which utilizes a form called an A-B-C (antecedent-behavior-consequence) (Sulzer-Azaroff & Mayer, 1977), reveals the context in which the behavior is likely to occur, but generally allows little, if any, quantification of behavior across time. Persons using this approach work closely with the subject and write brief descriptions of events that occur immediately before or after each instance of the target behavior. These descriptions are recorded to determine the consistency with which particular contextual events appear concurrently with the behavior. Although the procedure is easy to learn, there
can be problems with its implementation and with subjective interpretation of events.

A third approach (Lerman and Iwata, 1993) permits quantification on a scale and data collection on multiple events that occur independent of the target behavior. Frequency or interval/time sampling procedures are used to record occurrences of prespecified events and behaviors exhibited during a session by the subject and those interacting with the subject. The sessions usually range from 15 to 45 minutes (Bijou, Peterson, & Ault, 1968). This approach, designed to reveal sequences of behavior and their contextual variables through time, has been used in a variety of settings. And although it allows access to the subject in the natural environment, conclusions may be based on the presence of frequent irrelevant variables.

Lerman and Iwata (1993) conducted independent descriptive and experimental analyses to determine the extent to which the two methods would yield similar results. For five of the six subjects, data did not yield conclusions leading to similar results. Lerman and Iwata indicated that results of the study were limited in several respects. For example, additional or lengthier observation sessions might have produced more definitive results for descriptive analysis; treatment data to verify hypotheses based upon the findings of each approach were not presented; and the generality of the findings across subjects, time, and
settings were limited because the study was only a preliminary comparison.

The authors also concluded that descriptive analyses conducted in settings where variables and activities were more likely to be consistent (e.g., classrooms) would produce clearer results. In classroom studies by Sasso et al. (1992) and Lalli et al., (1993), experimental and descriptive data did yield similar conclusions about variables maintaining the target behavior. The authors of these studies argued that consistency was made possible because experimental manipulation was conducted in the natural environment (Lerman & Iwata, 1993). Lerman and Iwata stated that while this may be true, there are no empirical data to support the assumption and that additional studies are necessary. A valid descriptive analysis method could be an important alternative or possibly even a substitute for experimental analysis. If alternative forms of assessment methods could prescribe more effective interventions, then they, too, should be evaluated and applied (Vollmer & Smith, 1996).

Taylor and Romanczyk (1994) conducted a study to determine if results obtained in a descriptive analysis in the classroom could be replicated by conducting an experimental analysis. The study was an attempt to determine whether, by measuring the distribution of teacher attention among students with problem behavior, researchers could
generate empirically based hypotheses about the function of problem behavior.

The study was conducted in a university-based special education program for children and adolescents with autism, developmental disabilities, and emotional disorders. Classroom teachers nominated a group of students who, while in small-group or individual instructional settings, exhibited frequent episodes of problem behavior that was presumably maintained by escape or attention. Three female and 12 male students served as subjects.

In Phase 1, researchers determined the distributions of teacher attention among students by scoring videotaped sessions. Teacher behaviors were scored for any interval in which the teacher attended to the target student. Results obtained during Phase 1 indicated that for five of the students, the problem behavior was being maintained by attention. For the remaining 10 students, the behavior appeared to be maintained by escape (termination of an existing stimulus).

In Phase 2 of the study, Taylor and Romanczyk conducted a brief experimental analysis to identify the functional relationships between environmental events and a student's problem behavior. Previous research in this area found that, when students exhibited attention-maintained problem behavior, they received more attention than their peers (Taylor & Carr, 1992). The data suggested that researchers
might be able to generate empirically based hypotheses about
the escape and attention-seeking functions of students' problem behavior by measuring the distribution of teacher attention among students.

The three phases of the experimental analysis, which took place in a room familiar to the students, were baseline, initial assessment, and replication assessment. The control condition described by Iwata et al., (1982) served as baseline. In this phase, no demands were placed on the student. The therapist simply allowed the student to play with toys and praised the student when he or she played appropriately.

Results of the brief functional analysis indicated that during baseline, students generally displayed low levels of problem behavior. Results of the initial assessment for five of the students indicated that the problem behavior was maintained by attention. The five students exhibited high levels of problem behavior under conditions involving low rates of therapist attention. For nine of the subjects, it appeared that the problem behavior was maintained by escape from demands. These nine students exhibited the highest percentages of problem behavior during high-demand conditions. Results for the remaining student showed an undifferentiated pattern of behavior. This particular student had the highest rates of problem behavior during conditions involving low demands.
With the exception of the student whose data displayed an undifferentiated pattern, patterns exhibited in the initial assessment phase were replicated in the replication phase. For nine students, the conditions producing the lowest/highest levels of problem behavior in the initial assessment phase also produced the lowest/highest rates of problem behavior in the replication assessment phase. Similar results, although weaker, occurred for the remaining five students. The conditions that produced the highest/lowest levels of problem behavior in the initial assessment phase also produced high and low levels in the replication assessment phase, but not to the same extent. The researchers concluded that the results of the brief experimental analysis (Phase 2) confirmed the predictions made from results obtained during the descriptive analysis (Phase 1).

Although descriptive analysis is used because it involves repeated direct observation of the subject's behavior during natural situations (Mace & Lalli, 1991), there are limitations. For example, the method does not allow for sufficient control over the environmental contexts in which the behavior occurs (Iwata et al., 1994). Other concerns are the spatial proximity of the subject and the observer in the natural environment and the fact that some facilities do not have the resources necessary to conduct such observations (Mace & Lalli, 1991). Despite its
limitations, descriptive analysis appears suited for research conducted in applied settings such as schools, where the direct manipulation of all suspected variables is difficult.

There is growing recognition within applied behavior analysis that more research should be directed toward the study of the contingencies controlling human behavior. Several agree that broad contextual conditions may act as controlling variables that set the occasion for problem behavior (Symons, 1992). As previously stated, these conditions are likely to be more consistent in classroom-type environments. Thus, the classroom may be a viable setting for descriptive, function-based analysis procedures. The goal of this approach is to match the intervention to the results of the assessment. Development of the intervention is dependent on the function of the problem behavior (Vollmer & Smith, 1996). Therefore, function-based settings may ultimately be more beneficial to the students and teachers in the long term than the short-term reinforcement/punishment attempts currently being used to control problem behavior in the classroom (McNaughton, 1980).

Of the pretreatment assessment procedures discussed, the scatter plot appears to be the most likely candidate for use in a public school setting. Because of the scatter plot's perceived minimal amount of intrusion on the part of
the teacher, this assessment procedure, when compared to
other descriptive methods such as an A-B-C (antecedent-
behavior-consequence) chart (Sulzer-Azaroff and Mayer, 1977)
and another procedure that utilizes brief time intervals
(Bijou, et al., 1968), appears less intrusive and easier for
teachers to implement. Descriptive, nonexperimental methods
of this type may be implemented more quickly and more easily
by a wider range of practitioners (e.g., teachers, teacher
assistants, counselors, etc.) than experimental methods that
require controlled settings (Sturmey, 1995).

Scatter Plot

It is customary to try to identify contingencies
responsible for controlling behavior, but attempts to
isolate the variables often fail, possibly because the array
of potentially relevant stimuli is too broad. Past research
(Rincover and Koegel, 1975) has shown that controlling
stimuli might be too complex or too obscure and, as a
result, elimination of the problem behavior by altering
controlling stimuli may be difficult. Touchette et al.
(1985) argue that by utilizing the scatter plot, it may not
be necessary to identify the specific controlling variables
to eliminate the occurrence of problem behavior. The scatter
plot method makes patterns of responding identifiable and
can therefore suggest broader contextual events associated
with problem behavior.
The following case study (Touchette et al., 1985) demonstrates how utilization of the scatter plot method facilitated identification of relationships between target behaviors and environmental stimuli. After correlations were identified, the contextual environments were altered. This resulted in the reduction and elimination of target behaviors.

Case Illustration 1 involved a 14-year-old girl with autism who had a history of serious aggression. The problem behavior, which had first been noted at the age of 4, eventually became uncontrollable and necessitated "Joan's" removal from home. The scatter plot was used to identify environmental events associated with the problem behavior. Data were collected throughout the subject's waking hours, including weekdays and weekends. Throughout the period, a time-out procedure, which proved to be ineffective, remained in place to protect others.

A traditional line graph of Joan's baseline data failed to suggest controlling variables. The same baseline data plotted on a scatter plot produced a pattern revealing that assaults were most frequent during group hours, 1:00 to 4:00 p.m. Monday through Thursday, and less likely to occur on weekday mornings, at lunchtime, and after 4:00 p.m. The targeted problem behavior almost never occurred on Friday, Saturday, and Sunday.
After evaluating the data, it was determined that Joan's schedule should be revised. Conditions associated with the occurrence of problem behavior were replaced with conditions in which no problem behavior had occurred. Assaults decreased immediately. Subsequently, original program elements associated with the assaults were gradually phased into Joan's afternoon schedule. A follow-up, 12 months later, revealed that Joan was participating in group activities during three of the four hours between 1:00 and 5:00 p.m., with structured individual activities during the fourth hour.

The scatter plot had aided the researchers in identifying a pattern that suggested the assaults were more likely to occur at certain times of the day that correlated with activities in Joan's schedule. Elimination of those activities significantly reduced the problem behavior.

Case Illustration 2 involved "Tom," a self-injurious 23-year-old autistic male living in a community residence. A scatter plot was used to identify controlling variables associated with Tom's self-abuse. Self-abuse was defined as a blow to any part of the body or the striking of any part of the body against a solid object. During the assessment, Tom was given a small quantity of snack food following each five-minute interval in which the target behavior did not occur. When self-abuse occurred, Tom was immediately
required to place his hands behind his back for approximately 10 seconds after each self-hit.

Data were gathered and recorded on a scatter plot from 10:00 a.m. to 8:30 p.m. After five days, it was revealed that Tom's self-abuse almost always occurred after 3:00 p.m. Activities, schedule, and staff changed at 3:00 p.m. It was suggested that staff, one of the three elements, be altered. The morning aide was reassigned to work with Tom in the afternoon, and the afternoon aide was reassigned to work with Tom in the morning. The two other elements remained unchanged.

After the reversal, the scatter plot revealed that Tom's self-abuse had been displaced from late afternoon and evening to morning and early afternoon. After a return to the aides' original schedules, patterns of Tom's self-abuse again reversed. The problem was solved when Tom began to spend his mornings and early afternoons in a sheltered workshop. His late afternoons and evenings were spent with the aide associated with low rates of self abuse.

Case Illustration 3 demonstrated how apparently random scatter plot data may reflect an unstable environment. "Jim," a self-abusive autistic 15-year-old, resided in a school for autistic adolescents. Reinforcement and punishment procedures were in effect during the first 10 days of data collection. Inspection of the data revealed no pattern or trend associated with staff, time of day, or
activity. It appeared that Jim's loose schedule of activities that the staff thought to be reinforcing, along with the mild punishment, failed to reduce the rate of occurrence.

Jim's programs offered him a menu of choices every 30 minutes. Each activity continued for 30 minutes or until Jim withdrew his attention. Staff members rotated frequently because of the difficulty in supervising Jim. Because staff and activities were constantly changing, it was suspected that time of day or the constantly changing schedule influenced the self-abuse.

A fixed schedule of activities was implemented. Setting-activity combinations were sorted into five categories. A "5" was highly likely to provoke self-abuse, whereas a "1" was most likely to produce acceptable behavior. The new schedule included necessary personal hygiene activities. All other time periods least likely to produce self-abuse were filled with setting-activity combinations rated as "1," "2," or "3."

The residual self-abusive behavior formed a pattern. The problem behavior almost always occurred in the evening. When this pattern was identified, the evening schedule was changed to more closely resemble Jim's morning schedule. Jim's self-abuse was further reduced. Staff rotations were made so as to minimize Jim's problem behavior.
The above case illustrations (Touchette et al., 1985) demonstrate that patterns of behavior evident on a scatter plot can suggest environmental events that influence problem behavior. Thus it may be possible to reduce inappropriate behavior by eliminating the stimuli that influence it. Although scatter plot data can assume only two or three values that correspond to changes in rate within an observational interval, patterns of occurrence or nonoccurrence may be sufficient to suggest the control that different conditions may have. The method offers insights into patterns of responding not readily available from graphs of daily or weekly frequency.

In another study, specifically designed to further evaluate the use of the scatter plot, Symons (1992) attempted to apply the method in a different context, a special education classroom. This study differed from the Touchette et al. (1985) study by employing a different population exhibiting different behaviors. Four elementary-aged students diagnosed as emotionally disturbed or behaviorally disordered served as subjects. The subjects were chosen because no previous studies had investigated behavior-disordered children in a classroom context and because functional assessment via the scatter plot had potential as a useful tool for the classroom staff. Data were collected by teachers and two staff aides.
In Case Study One, data for the subject identified as "T" were plotted on a scatter plot in an effort to identify environmental events that could be associated with the occurrence of talking out of turn. A time-out procedure was in effect within the classroom throughout the study, but data were not collected when the student was in time-out. Data were collected during the academic portion of T's day, including line-up time.

During weeks 1 and 2, T's problem behavior occurred at a high rate between 8:30 and 9:00 a.m. and again after recess between the hours of 10:30 and 11:00 a.m. After medication began during week 3 of the study, a visual analysis of the data suggested an immediate decrease in problem behavior. During week 4 of the 5.5 weeks of baseline, a new student was moved into the class, at which time observation and recording continued to see if the new student would affect the rate of T's talking out. After additional data had been collected, the teacher, aide, and researcher agreed that, according to the scatter plot, talking out seemed more likely to occur during first period (8:00 to 9:00), after recess (10:20 to 11:00), and during the line-up procedure.

The intervention consisted of manipulating the morning line-up procedure so as to give the teacher and aide the opportunity to greet and encourage students prior to the first period of the day. This change in procedure also
provided the teacher with the opportunity to give a brief moment of individual attention to T and to describe the morning's task. Visual analysis of the scatter plot after intervention revealed a clear reduction of problem behavior during the entire recording interval. The antecedent manipulation, switching from a group to an individual line-up routine, set the occasion for non-problem behaviors to occur.

In Case Study 2, data for "R" were recorded via the scatter plot to identify events associated with talking out. Observations and recordings were made throughout R's academic day, including line-up. As with T, data were not recorded during the times R was placed in time-out.

The first three weeks of baseline data revealed by the scatter plot indicated that talking out was most prevalent upon R's entrance into the classroom after arriving at school (8:30 to 9:00) and again after morning recess (10:20 to 11:00). Because a new student was added to the class and researchers wanted to see if the addition would affect R's rate of talking out, a program change was not introduced during week 4. Weeks 5 and 6 revealed that R's talking out increased during the period following entrance into the classroom, but decreased after morning recess.

The intervention proposed by the teacher, aide, and researcher for R was identical to T's. Visual inspection of the scatter plot data suggested that R's talking out had
decreased during the first interval (8:30 to 9:00), as well as throughout the entire day. According to the data, talking out remained at a low rate through week 9.

In Case Study 3, a time-out procedure and step chart were in effect throughout the study for student B. Data were collected throughout the academic day and were used to identify environmental events associated with B's inappropriate declarations about events and people. It appeared that B's declarations occurred during transition times, upon entering the classroom after morning recess (10:30 to 11:00), and between morning recess and lunch (10:30 to 12:00). During week 4 of the study, B's rate of problem behavior occurred in 100% of the time intervals between 10:30 and 11:00.

The teacher, aide, and researcher agreed that, if conditions in the interval after morning recess could be altered, the rate of inappropriate declarations would decrease. The revisions consisted of providing more structure in the time period following morning recess. Originally, the students were to enter the room and quietly wait for the teacher to give instructions. The team believed that this "down time" was setting the occasion for problem behavior.

The intervention consisted of placing a math worksheet on each of the desks. Students were to immediately begin completing the worksheet upon entering the classroom. B was
prompted to do so prior to leaving recess. It was expected that more structure would lessen B's opportunities to emit problem behavior. The new class routine had a positive effect on B's occurrences of problem behavior, but the team felt the need to further reduce the occurrences.

The second intervention was in place for four weeks. It consisted of placing the math worksheet in the students' boxes. It was expected that this procedure would further reduce problem behavior that seemed to be occurring at the moment B walked into the classroom. For that particular period of day, it appeared that the intervention had proved to be effective. However, there was a small increase in the rate of problem behavior across the entire school day after the second intervention had been implemented. Yet the levels were still less than original baseline levels. The researcher could only conclude that B's access to integration also appeared to have an effect on B's behavior. Access to integration had lessened, for reasons unknown to the researcher, after the two interventions had been implemented.

Finally, in Case Study 4, student "J" had a significant reduction in rate of noncompliance after the first week of observation. J's rate of problem behavior approached zero during the two weeks following the Christmas break. Except for occasional "bursts" of noncompliance, J's rate of
problem behavior remained unchanged throughout the study. Because of this, no intervention was deemed necessary.

For three of the four behaviorally disordered elementary students who served as subjects, the interventions guided by the scatter plot assessments appeared to be effective in reducing high frequencies of problem behavior. Data for the three students who received intervention indicated a reduction in the percentage of intervals containing problem behavior. For two of these three students, reductions across the entire school day were evident.

In a study that combined both descriptive and experimental pretreatment assessment procedures, Lalli, et al. (1993) applied the scatter plot as a means of obtaining a general analysis of the activities in which the target behaviors of three students was most likely to occur. The scatter plot was used as part of a four-phase assessment to gather preliminary data on three profoundly retarded students identified by their teachers for participation in the study because of ongoing behavior problems. After conducting an initial problem-identification interview, the researchers had each teacher (one for each student) perform a scatter plot analysis of the student's target behavior over a five-day period to identify the times when the target behaviors were most likely to occur. Teachers recorded data per 30-minute intervals in one of three categories: zero
occurrences, low occurrences (1 to 10 occurrences per interval), and high occurrences (more than 10 per interval). After collecting the data, the teachers and researchers visually inspected the data to identify specific classroom activities associated with high occurrences of the target behavior.

Even though the antecedent and subsequent event categories identified during a visual inspection of the scatter plot data were not selected by the researchers for further evaluation, this study is one of only a few published studies in which the scatter plot method was implemented in a public school by teachers. But like other scatter plot assessment studies, the subjects in the Lalli et al. (1993) investigation were developmentally disabled.

The aforementioned case studies by Touchette et al. (1985), Symons (1992), and Lalli et al. (1993) suggest that the scatter plot may be a viable method for collecting data when conducting a pretreatment assessment in an applied setting.

As suggested by Touchette et al. (1985), the need for a scatter plot grid can arise when a behavior of concern occurs frequently and informal observation fails to produce information regarding an environmental event that might be controlling the problem behavior. A scatter plot can expand the search for controlling variables by enabling the researcher to more closely identify associated stimuli.
Thus, as a screening tool to identify variables that might otherwise be neglected, such methods of assessment can be useful (Smith & Iwata, 1997).

Touchette et al. (1985) maintain that precisely identifying controlling stimuli may not be necessary in all cases. For those cases which require revealing the basic principles underlying behavioral disorders, Smith and Iwata (1997) believe that experimental analysis may be necessary. Experimental analyses through hypothesis testing should be reserved for cases where broad-based assessments, such as the scatter plot method, have proved ineffective.

Pretreatment Assessment Applications in Public Schools

The pretreatment assessment of behavior has clearly established the significance of antecedent and consequent stimuli in the control and understanding of human behavior. Pretreatment assessment investigations have obviously extended early applied behavior analytic accomplishments that focused primarily on the consequences of problem behavior. These procedures suggest that interventions based on explicit consideration of antecedent conditions and contextual events are likely to achieve a higher rate of success (Wheldall, 1981).

Despite these claims, reviews of the literature have noted that a majority of pretreatment assessments are conducted with individuals with mental handicaps exhibiting
self-injurious and stereotypic behavior. A search for pretreatment assessment-based interventions for non-disabled children exhibiting problem behavior in regular public school classrooms has revealed a lack of evidence for interventions guided by pretreatment assessment data.

It is this researcher's opinion that this lack of evidence is a major factor contributing to teachers' unwillingness to accept and adopt behavioral technology. Fantuzzo and Atkins (1992) maintain that the development of school-based strategies that are both sensitive to the needs of a diverse student population and suitable for use in schools is necessary if behavioral technology is to be widely accepted by school personnel. They state that, because school-based interventions have taken the form of outside experts demonstrating the effectiveness of classroom interventions, emphasis has been on the demonstration of the procedures, not the integration of these procedures into the classroom environment. Such an approach leaves teachers with the burden of making the outside expert's methods useful and long-lasting (Fantuzzo & Atkins, 1992).

The constraints on teachers, whose job it is to instruct students while maintaining proper classroom behavior, must be taken into consideration when attempting to conduct a pretreatment assessment. Failure to do so will more than likely result in teachers finding it too difficult to conduct the assessment while teaching. The level of
teacher participation and the "noise" of the classroom may be keys to understanding the use of behavioral technology in the classroom (Fantuzzo & Atkins, 1992).

The need for a teacher-centered, classroom-based technology led this researcher to investigate the scatter plot, a descriptive form of pretreatment assessment. Previous studies on the scatter plot indicated that implementation of this procedure facilitated discovery of effective strategies while promoting teacher use of behavioral technology. Neglecting to consider practices that enable and empower teachers to affect relevant behavior change will result in teachers resorting to conventional, preplanned, reactive treatments that may prove to be successful in the short term, but often fail in the long term. For example, sending a student to in-school suspension for the day will end the problem behavior for that day. However, if the student's problem behavior is being maintained by escape from the classroom environment, the suspension may virtually guarantee that the behavior will occur the next time the student is present in the classroom, unless contingencies are arranged according to function analytic considerations.
CHAPTER III

METHODOLOGY

The methodology and procedures for the study are presented in this chapter. As previously mentioned, the purpose of this study was to ascertain if a pretreatment assessment procedure previously utilized primarily by practitioners with special populations, could effectively be implemented and utilized by a group of 13 public middle school teachers in a North Texas suburb of Dallas, Texas. Previous studies on the scatter plot method of assessment conducted in educational settings indicated that implementation of this procedure facilitated researcher-teacher discovery of effective strategies while promoting teacher use of behavioral methods.

Context

A middle school, located in an older section of a North Texas suburb of Dallas, was the site of the investigation. The school's attendance zone encompassed a wide range of socio-economic levels with over 31% of the students at the school qualifying for the free lunch program. A majority of those qualifying for the free lunch program resided in area of the attendance zone composed primarily of apartment communities.
Disciplinary issues at the school ranged from minor offenses to offenses which required the involvement of the local police. A city police officer had been assigned as a school liaison officer to the school for two years prior to this study. The officer maintained an office in the school, which he occupied every day throughout the school year.

During the 1997-1998 school year, the average daily enrollment of students at the middle school was 1,007 students. Of these students, 60.1% were White, 23.1% Hispanic (primarily Mexican-American), 10.4% African-American, 6.1% Asian/Pacific Islander, and .3% Native American. The percentage of students passing the reading portion of the Texas Assessment of Academic Skills (TAAS) test for the semester in which the study was conducted was 83% for grade 6, 88% for grade 7, and 93% for grade 8. The percentage of students passing the math portion of the TAAS test was 87% for grade 6, 83% for grade 7, and 89% for grade 8. In addition to the reading and math portions of the TAAS test, students in grade 8 were required to take a writing portion, a science portion, and a social studies portion. The percentage of students passing these additional portions of the TAAS test were 90%, 91%, and 80%, respectively.

In this study, students were observed during five core classes and two elective classes. English, math, science, reading, and history comprised the core classes. Elective classes included Spanish, art, and industrial technology.
Each class period, with the exception of fourth and advisory (homeroom), were 45 minutes in length. In an effort to accommodate all four 30-minute lunch periods, fourth period was 60 minutes in length. An advisory period, which took place immediately after third period, was 25 minutes in length.

Each classroom teacher had in place a set of schoolwide rules that each student was to follow while in class. The rules, which were reintroduced by the administration at the beginning of each school year, were generally accepted by all the teachers. The rules included raising one's hand before speaking, remaining in one's seat until told otherwise, respecting others, and coming prepared for class. Violations of the rules usually resulted in either a conference with the teacher, a school detention, a call to the parents, or a visit to the dean. The number of previous violations and/or the degree to which one of the rules was violated determined the consequence(s).

Subjects

Selection of the core group of teacher participants was originally based upon membership in a "team." Because only seventh grade teachers at this particular school were assigned to teams, the researcher was confined to only selecting participants who taught this grade level of students. Five core teachers sharing the same group of students, a common planning time, a common teaching
schedule, and a common area of the building, along with seven elective teachers and an instructional assistant served as participants. The five core teachers identified four students with a history of problem behavior as subjects for observation.

Teacher profiles. Eleven female teachers, one female instructional assistant (teacher's aide), and one male teacher participated in the study. Five of the teachers had master's degrees in education, and their classroom teaching experience ranged from 6 to 29 years. The other seven teachers had received bachelor's degrees in their respective fields. Their teaching experience ranged from 1 to 24 years. The instructional assistant, the recipient of a high school diploma, had three years experience as an aide. Of the thirteen participants, twelve were Caucasian, one was Hispanic, and one was African-American. Ages ranged from 23 to 57 years of age. The teachers' characteristics are summarized in Table 1.

All team teachers at the school were assigned both a team conference period and an individual conference period. During the team conference period, the team of teachers was responsible for discussing individual student achievement and planning interdisciplinary units. All meetings conducted by the researchers were held during the team's conference period (third period).
After being informed about the purpose of the study and the need to observe students who often exhibited problem behaviors in the classroom, the team of teachers met with the researcher in late January to discuss and recommend students for observations. Because the meeting was held during this time of the school year, the teachers on the team had had enough time (the fall semester) to become very familiar with each student's personality, classroom behavior, and academic progress.

Table 1.

<table>
<thead>
<tr>
<th>Teacher</th>
<th>Gender</th>
<th>Age</th>
<th>Race</th>
<th>Experience</th>
<th>Degree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>female</td>
<td>46</td>
<td>Hispanic</td>
<td>24</td>
<td>bachelor's</td>
</tr>
<tr>
<td>2</td>
<td>female</td>
<td>57</td>
<td>White</td>
<td>28</td>
<td>master's</td>
</tr>
<tr>
<td>3</td>
<td>female</td>
<td>55</td>
<td>White</td>
<td>29</td>
<td>master's</td>
</tr>
<tr>
<td>4</td>
<td>male</td>
<td>n/a</td>
<td>White</td>
<td>20</td>
<td>master's</td>
</tr>
<tr>
<td>5</td>
<td>female</td>
<td>27</td>
<td>White</td>
<td>1</td>
<td>bachelor's</td>
</tr>
<tr>
<td>6</td>
<td>female</td>
<td>29</td>
<td>White</td>
<td>6</td>
<td>master's</td>
</tr>
<tr>
<td>7</td>
<td>female</td>
<td>23</td>
<td>White</td>
<td>1</td>
<td>bachelor's</td>
</tr>
<tr>
<td>8</td>
<td>female</td>
<td>30</td>
<td>White</td>
<td>5</td>
<td>bachelor's</td>
</tr>
<tr>
<td>9</td>
<td>female</td>
<td>48</td>
<td>White</td>
<td>9</td>
<td>bachelor's</td>
</tr>
<tr>
<td>10</td>
<td>female</td>
<td>24</td>
<td>White</td>
<td>1</td>
<td>bachelor's</td>
</tr>
<tr>
<td>11</td>
<td>female</td>
<td>52</td>
<td>White</td>
<td>23</td>
<td>master's</td>
</tr>
<tr>
<td>12</td>
<td>female</td>
<td>31</td>
<td>Afro-Am.</td>
<td>3</td>
<td>diploma</td>
</tr>
<tr>
<td>13</td>
<td>female</td>
<td>27</td>
<td>White</td>
<td>4</td>
<td>bachelor's</td>
</tr>
</tbody>
</table>

Student profiles. Because of the situational complexity in which teachers were required to observe and record student behavior while continuing to engage in their normal everyday teaching activities, the number of students (subjects) to be observed was limited to four. Four seventh-grade students served as subjects: one Hispanic female, one White male, and two African-American males. Ages ranged from
13 to 14 years of age. Each student was enrolled in eight classes, composed of the five core classes, an advisory class, and two elective courses. The four students selected for observation were discussed individually during a meeting conducted by the researcher. At this meeting, one or more of the team teachers characterized each student subject by describing the personality and behaviors observed by the teacher(s) during the current school year.

Student One, an Hispanic 13-year-old female student, was described by her team teachers as being impulsive, boisterous, and noncompliant. The student was also described as being physically abusive (minor incidents) and disrespectful.

Student Two was 14-year-old African-American male who had been retained in the seventh grade. He was described by the teachers on the team as being unpredictable. Behaviors ranged from being cooperative and respectful to being noncompliant and disrespectful.

Student Three, a 13-year-old African-American male, was described as loud, independent, and uncooperative. Additionally, Student Three was characterized as a student with a short attention span who constantly distracted others in the room.

Student Four was a 13-year-old, White, special education student diagnosed with a learning disability. The teachers on the team described him as being a quiet student
whose only behavioral problem in the classroom appeared to be noncompliance.

Other specific information pertaining to each student such as academic grades, conduct grades, and TAAS test scores were not accessible to the researcher. A summary of the characteristics for each student as described by the teachers on the team are presented in Table 2.

Table 2.

<table>
<thead>
<tr>
<th>Student Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student 1: Female</td>
</tr>
<tr>
<td>13 years old</td>
</tr>
<tr>
<td>Characteristics:</td>
</tr>
<tr>
<td>impulsive, aggressive,</td>
</tr>
<tr>
<td>boisterous, noncompliant (at times), loud, talks back to teachers</td>
</tr>
<tr>
<td>Student 2: Male</td>
</tr>
<tr>
<td>14 years old</td>
</tr>
<tr>
<td>Characteristics:</td>
</tr>
<tr>
<td>social problems, retained in 7th grade, unpredictable behavior</td>
</tr>
<tr>
<td>Student 3: Male</td>
</tr>
<tr>
<td>13 years old</td>
</tr>
<tr>
<td>Characteristics:</td>
</tr>
<tr>
<td>loud, independent, short attention span, constantly moving</td>
</tr>
<tr>
<td>Student 4: Male</td>
</tr>
<tr>
<td>13 years old</td>
</tr>
<tr>
<td>Characteristics:</td>
</tr>
<tr>
<td>special education student, quiet, noncompliant</td>
</tr>
</tbody>
</table>

Dependent Variables

Because each student exhibited a variety of problem behaviors (as previously depicted in Table 2.), the researcher and the core teaching staff were unable to identify only one target behavior per subject. Utilizing the
school-wide rules, described previously, as a basis for determining the target behaviors, the teachers and the researcher compiled a list of six generally problematic, yet easily identifiable behaviors. According to the core teachers, the recommended target behaviors were all behaviors that one or more of the students exhibited frequently. The target behaviors, categorized by all the teachers in the study as being incompatible with learning, are listed in Table 3. The categories for analysis were similar to those used in previous studies conducted in classroom settings (Becker, et al., 1967; Hall, et al., 1968).

Table 3.

<table>
<thead>
<tr>
<th>Target Behaviors</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Blurting out, commenting, and vocal noise.</td>
</tr>
<tr>
<td>2. Disturbing others directly.</td>
</tr>
<tr>
<td>3. Making disruptive noises with objects (tapping pencils, tapping on desk, etc.).</td>
</tr>
<tr>
<td>4. Doing something different from that directed to do.</td>
</tr>
<tr>
<td>5. Attending to and/or carrying conversations with others when it is not permitted.</td>
</tr>
<tr>
<td>6. Engaging in gross motor behaviors (getting out of seat, throwing objects, etc.)</td>
</tr>
</tbody>
</table>

INSTRUMENTATION

Scatter Plot. A pretreatment assessment procedure developed in the context of residential programs for
autistic adolescents was used by the teachers to record occurrences of target behaviors. The procedure, which utilizes a scatter plot (see Figure 2.), was used in an attempt to aid the teachers in identifying possible classroom variables responsible for the student's problem behavior.

The scatter plot developed for this study divided time of day vertically into 15-minute segments, and successive days were represented horizontally. A blank cell indicated a zero rate of occurrence for that interval. A diagonal line within a cell indicated one or two occurrences. And a shaded cell indicated three or more occurrences of the target behaviors.

Data were recorded directly on the scatter plot (per 15-minute interval) by the teacher during each class period that the student was present in that class. With the exception of the advisory period, which was 25 minutes in length, and fourth period, which was 60 minutes in length, all classes were in session for 45 minutes.

Interval recording was used to measure the presence or absence of behavior within specific time intervals. All class periods of 45 minutes or longer were divided into intervals of 15 minutes. For example, because most of the classes were in session 45 minutes and the researcher was using a 15-minute interval measurement, each class period was divided into three equal 15-minute recording units.
<table>
<thead>
<tr>
<th>STUDENT #</th>
<th>WEEK #</th>
</tr>
</thead>
<tbody>
<tr>
<td>PERIOD</td>
<td>TIME</td>
</tr>
<tr>
<td>8:45 - 9:00</td>
<td></td>
</tr>
<tr>
<td>9:00 - 9:15</td>
<td></td>
</tr>
<tr>
<td>9:15 - 9:30</td>
<td></td>
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<tr>
<td>9:35 - 9:50</td>
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</tr>
<tr>
<td>9:50 - 10:05</td>
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</tr>
<tr>
<td>10:05 - 10:20</td>
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<tr>
<td>10:25 - 10:40</td>
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<td>10:40 - 10:55</td>
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<td>3:15 - 3:30</td>
<td></td>
</tr>
<tr>
<td>3:30 - 3:45</td>
<td></td>
</tr>
</tbody>
</table>

**Figure 2.** Sample scatter plot adapted by the researcher for use in the middle school.
According to Cooper et al. (1987), interval size selected should provide the observer, in this particular case the teacher, with sufficient time to observe and record reliably.

Prior to collecting data, all 13 teachers were trained to use a scatter plot. In addition to the 13 teachers, teacher assistants assigned to team teachers were trained for inter-observer agreement (IOA) purposes. A university graduate with a psychology degree and college students enrolled in an applied behavior analysis course served as IOA observers.

A videotaped recording was made of three students (one sixth-grade male, one eighth-grade female, and one eighth-grade male) acting out a variety of target behaviors. Each training session consisted of having the researcher first explain the purpose of the study; second, present and explain a scatter plot with hypothetical data; third, introduce the target behaviors to be observed; and finally, ask the observers to view the videotape and record occurrences of the target behaviors per one-minute interval on a sample scatter plot. Practice recordings were done until reliable observations of at least 90% were obtained by each observer. Whereas a videotape of an actual class in session might have better reflected a realistic situation on which to train the teachers and other observers, the
policies pertaining to the videotaping of students made this option too difficult.

Data were recorded per 15-minute interval throughout the class period by the teacher. For example, at the end of every 15-minute interval the teacher would either leave the cell blank, draw a diagonal line, or fill in the cell. Intervals spanning passing periods, lunch, and field trips were not recorded. Recording in such environments appeared to be too difficult for the teacher to reliably accomplish. Limiting the recordings to the classroom reduced additional variables introduced by multiple environments.

Each teacher in the study possessed his or her own style of teaching and maintained individual disciplinary measures throughout the study. The degree to which students were engaged also varied from teacher to teacher. Despite variations in teaching style and disciplinary measures, it was the researcher's observation that classroom discipline among the teachers who participated in the study was not a problem overall.

After a month of collecting data, the researcher visually analyzed the scatter plot and examined the teachers' execution of the instrument by reviewing IOA coefficients. The data were then presented to the teachers by the researcher at a meeting conducted a week after the data collection period had ended. The meeting was held during the team's conference period (third period).
During the meeting, the scatter plot was visually analyzed by the researcher and teachers to determine if a pattern of behavior existed for each student. Those present discussed whether the data indicated any correlation between the absence or occurrence of problem behavior and variables associated with the classroom environment. For example, was the problem behavior highly correlated with particular tasks, the presence or absence of certain people, the time of day, or a combination of these and other variables? Conclusions were then made based upon the association of suspected variables and the observed rates of student behavior. The conclusion are discussed in greater detail in Chapter 4.

Teacher Questionnaire. In an effort to gain further insight into the teachers' perceptions about the scatter plot and its effectiveness, a questionnaire was developed and administered by the researcher upon completion of the scatter plot documentation process (see Appendix A). The questionnaires were completed independently by all 13 teachers. Teachers were asked to rate different aspects of the scatter plot by responding either yes or no to certain questions; and by rating other responses on a Likert-type scale ranging "strongly disagree" to "strongly agree". The 28 items related to implementation of the study, the identification and recording of target behaviors, and the overall usefulness of the pretreatment assessment procedure.
A final question asked teachers to express in writing any additional comments pertaining to the study.

Yes responses were coded 1, whereas no responses were coded 0. Other coding ranged from 1 for "strongly disagree" to 5 for "strongly agree." After coding, all responses were then tabulated, and entered into a computer system equipped with statistical analysis capabilities.

**Reliability.** Interobserver reliability checks were conducted a minimum of 20% of all class periods for each subject by the trained IOA observers. Reliability coefficients were calculated by dividing agreements by agreements plus disagreements x 100. Agreements were considered to have occurred if both the teacher and the outside observer rated an occurrence of the target behavior(s) identically. Partial agreement (.5) was considered to have occurred if both observers recorded an occurrence, but not at the same rate.
CHAPTER IV

RESULTS AND DISCUSSION

The purpose of this study was to ascertain if a pretreatment assessment procedure previously utilized primarily by practitioners working with special populations, could effectively be implemented and utilized by a group of 13 public middle school teachers in a North Texas suburb of Dallas.

The occurrence of specified target behaviors was recorded by the teachers for four seventh-grade students who had previously been identified by the teachers as exhibiting problem behavior. For four weeks, direct observation data were recorded on the scatter plot during each of the student's eight classes (approximately six hours per day). The results of this investigation answer the three research questions that formed the basis for this study:

1. Can a group of 13 middle school teachers reliably implement a scatter plot to observe and record the behavior of four seventh grade students identified as being "problems" in the classroom?

2. Will the plotted data display a pattern of behavior that is meaningful to the teacher?

3. How will the 13 teachers respond to this study?
A summary of the findings in response to each question follow. The findings include a discussion of the primary dependent variables of interobserver agreement and the data collected for each student via the scatter plot. Teacher responses to the questionnaire are also presented along with a discussion of the limitations of this study.

INTEROBSERVER AGREEMENT

Question 1: Can a group of 13 middle school teachers reliably implement a scatter plot to observe and record the behavior of four seventh grade students identified as being "problems" in the classroom?

Interobserver agreement was calculated using the following formula: agreements/agreements plus disagreements x 100. An interval was scored an agreement if the target behavior was recorded by the observers at the same rate. An interval was scored as a partial agreement (.5) if both observers recorded an occurrence but at a different rate. In all cases, interobserver agreement was evaluated for 15-minute intervals. Interobserver agreement probes for each student resulted in the following coefficients:

Subject 1: Mean = 79.7%, range 66.6% to 100%
Subject 2: Mean = 72.8%, range 50.0% to 100%
Subject 3: Mean = 66.9%, range 50.0% to 91.6%
Subject 4: Mean = 59.3%, range 50.0% to 85.0%

Overall reliability was 70%. Although the teachers were trained according to recommendations made by Merrell (1989)
which included meeting as a group, practicing, discussing discrepancies, and establishing a set criterion, interobserver agreement failed to suggest that accuracy was achieved. Interobserver reliability checks failed to achieve a desired overall reliability of 90% or higher. Coefficients ranged from a low of 50.0% to a high of 100%. Poor agreement may have been a function of the observer's inability to maintain continuous observation for the entire class period due to temporary interruptions (Kahng, et al., 1998). Observer drift, which refers to the tendency of observers to change the manner in which they apply the definitions of behavior over time, may have also been a factor (Kazdin, 1977). Possible explanations for failing to meet the desired percentage rate include the total number of students in a class, the number of subjects observed per period, the teacher's location in the classroom, and the subject's ability to recognize if the teacher was "looking."

Previous studies (Touchette et al., 1985 and Symons, 1992) that utilized the scatter plot in assessing the behavior of students were conducted in settings limited to a small number of students. In this study, class size ranged from approximately 13 to 25 students per period. It is this researcher's opinion that the number of students each teacher had to "teach and supervise" while recording data may have affected the teachers' observation and collection of data.
The number of students observed per period may have also been a factor in failing to obtain an IOA of at least 90%. Because of the team approach, it was necessary for some of the teachers to observe and record data for as many as two students per period. This, along with the location of the teacher in the classroom, may have affected IOA.

Because the teacher was expected to continue doing his or her daily instruction while collecting data, the location of the teacher in the classroom may have also been a factor in failing to obtain an IOA of 90%. For example, having his or her back to the students while writing on the chalkboard or while helping another student, may have prevented the teacher from observing the subject's behavior. This was especially true in this study because all the subjects had the ability to discern when the teacher was or was not "looking." The presence of an outside observer did not appear to have this same effect on the subjects.

Although accuracy (a minimum of 90%) was established during training for all observers, IOA checks throughout the observation period failed to obtain a mean of 90% or higher for all students. Coefficients ranged from a low of 50.0% to a high of 100%.

Although the collected data were not able to provide a low percentage of IOA pertaining to each student, they did provide insight into possible patterns of behavior. The patterns appear to be related to variables including time of
day, presence of another student, subject content, the teacher's classroom management style and/or the number of years teaching experience. However, further investigation is necessary to establish functional relationships between the problem behavior and the aforementioned environmental events. Scatter plot data for each subject follow.

**SCATTER PLOT DATA**

Question 2: Will the plotted data display a pattern of behavior that is meaningful to the teacher?

A pattern of behavior, should one exist, will emerge as soon as several days are plotted (Touchette, et al., 1985). The researcher and the 13 teachers met at the end of the data collection period to determine if a pattern of behavior existed and to identify possible variables responsible for the occurrence or absence of problem behaviors exhibited by the students.

**Student One.** Student One was a 13-year-old girl with a history of disruptive behavior in the classroom. Student One's behaviors as described by one or more teachers on the team included excessive talking, aggression, and noncompliance.

Interobserver agreement probes for Student One ranged from 66.6% to 100%, with a mean of 79.7%. IOA checks for Student One failed to achieve a desired overall reliability of 90% or higher. Despite only achieving an IOA coefficient
of 79.7% overall, visual analyses of Student One's data suggests a possible pattern of behavior.

Figure 3 presents Student One's scatter plot data. The data appear to reveal a definite pattern of occurrence throughout the student's day. This was especially evident during periods 4 and 6.

During period 4, Student One had one to two occurrences per interval 54.1% of the time and three or more occurrences 26.3% of the time. Occurrences during period 6 indicated that the student engaged in disruptive behavior a total of 65.8% of the recorded intervals. It must also be noted that during periods 2 and 7, Student One had no occurrences of problem behavior 90.1% and 90.7% of the time, respectively. Table 4 presents the percentage occurrence per class period by rate category.

**Table 4.**

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<th>Class Period</th>
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Data for Student One indicate that during periods 1, 4, and 6, the student engaged in problem behavior approximately
### Table

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**Legend:**
- ISS: In-school suspension
- SUS: Student suspended
- H: Host (math tutoring)
- A: Student absent
- S: Teacher substitute
- D: Dean

**Figure 3.** Data on scatter plot for Student One as collected by each teacher.
47.1%, 80.4%, and 65.8% of the time, respectively. A review of the teacher profiles suggests that a lack of teaching experience was not a factor. The average years teaching experience for all three teachers was 2.3 years. Yet during period 7, in which the teacher only had 1 year of teaching experience, the rate of inappropriate behavior was only 9.2%. The low rate of problem behavior was similar to that during period 2 (English), a class taught by a teacher with 28 years experience. It should be noted that, during period 4, Student One and Student Three were classmates. During this period, Student Three also had a high rate of occurrence of inappropriate behavior. A further investigation into this, and other variables possibly responsible for controlling the behavior, is warranted.

Student Two. Student Two had been retained in the seventh grade the previous year and had been required by the CAT (campus assessment team) committee to enter EXCEL (a disciplinary program). Student Two exhibited unpredictable behavior that ranged from being quiet and cooperative to being verbally abusive and noncompliant.

Interobserver agreement probes for Student Two ranged from 50.0% to 100%, with a mean of 72.8%. IOA checks for Student One failed to achieve a desired overall reliability of 90% or higher. Despite only achieving an IOA coefficient of 72.8% overall, visual analyses of the Student Two's data suggests a possible pattern of behavior. Data collected by
the teachers during the observation period are represented in Figure 4.

According to the data, Student Two had the most occurrences of problem behavior during periods 1, 3, and 5. During these periods, Student Two's average percentage of intervals with problem behavior was 72.1%, 56.1%, and 71.3%, respectively. During period 7, Student Two had a 0 occurrence of problem behavior. Student Two's percentage of problem behavior is presented in Table 5.

Table 5.

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For Student Two, the scatter plot indicated that three or more occurrences of the target behaviors per interval were more likely to occur between the hours of 8:45 to 11:10. Classes during this time included history, English, and industrial technology, respectively, with most problem behavior occurring during period three. Data collected during reading class also displayed a high average percentage of intervals with problem behavior (64.2%) in which the student engaged in 1-2 occurrences of problem
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</tbody>
</table>

**Figure 4.** Data on scatter plot for Student Two as collected by each teacher.
behavior. Science (sixth period) also indicated a higher than average occurrence of inappropriate behavior.

Occurrences of three or more per interval were never recorded for the advisory period or fourth period (mathematics) which were taught by a teacher with four years' experience and one year of experience, respectively. As significant, during seventh period (life management skills) the teacher never recorded an occurrence of problem behavior. This is especially interesting since a reliability coefficient of 88.8% (almost the desired 90%) was calculated for period 7. Data such as that recorded during advisory, fourth period and seventh period may lead one to seek additional information pertaining to these particular classes. For example, one may inquire about the content, the teacher's discipline management techniques, or the teacher's style of teaching.

**Student Three.** Student Three was a 13-year-old male with a history of problem behavior, but no known learning disabilities.

Interobserver agreement probes for Student Three ranged from 50.0% to 91.6%, with a mean of 66.9%. IOA checks for Student Three failed to achieve a desired overall reliability of 90% or higher. Despite only achieving an IOA coefficient of 66.9% overall, visual analyses of the Student Three's data suggests a possible pattern of behavior.
According to a visual analysis of the scatter plot, (see Figure 5,) the student, characterized by his teachers as being an excessive talker with a short attention span, appeared to have a high rate of problem behavior during advisory, period 4, and period 7. During the advisory period, Student Three engaged in problem behavior approximately 64.7% of all intervals. In period 4, which immediately followed the advisory period, the student had an occurrence rate of 87.5%. During period 7, a percentage of 74.4% of all intervals indicated the occurrence of problem behavior. A striking difference was noted during period 5. Table 6 presents the percentage rate of occurrence for all periods.

Table 6.

<table>
<thead>
<tr>
<th>Class Period</th>
<th>Teacher #</th>
<th>Rate of Occurrence</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0</td>
<td>1-2</td>
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<tr>
<td>1</td>
<td>2</td>
<td>75.0</td>
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<td>2</td>
<td>7</td>
<td>63.3</td>
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<tr>
<td>3</td>
<td>6</td>
<td>72.2</td>
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<tr>
<td>adv.</td>
<td>10</td>
<td>35.3</td>
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<td>4</td>
<td>8</td>
<td>12.5</td>
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<tr>
<td>5</td>
<td>11</td>
<td>98.0</td>
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<tr>
<td>6</td>
<td>3</td>
<td>49.1</td>
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<tr>
<td>7</td>
<td>10</td>
<td>25.4</td>
</tr>
</tbody>
</table>

For Student Three the scatter plot grid also indicated a significant pattern of nonoccurrence during the life management skills class (period 5). Yet the inter-observer reliability coefficient was only 58.3%. The life management skills teachers was a 52 year old female with over 23 years
Figure 5. Data on scatter plot for Student Three as collected by each teacher.
of teaching experience. Other scatter plot data depicted a random occurrence with the exception of advisory and fourth (reading) periods where a pattern appears to exist. The grid for these two particular class periods clearly indicates that disruptive behavior was a common occurrence. As mentioned earlier, Student Three and Student One were classmates. A comparison of the two grids indicates that both students were often engaged in disruptive behavior during the same intervals, leading one to conclude that the behavior of one student may have been influencing the behavior of the other.

**Student Four.** The scatter plot data for Student Four, a 13-year-old male special education student, characterized by a majority of his teachers as being quiet but extremely noncompliant, indicated a fairly constant rate of problem behavior throughout most of the day. This is evident in Figure 6.

Interobserver agreement probes for Student Four ranged from 50.0% to 85.0%, with a mean of 59.3%. As with all other students observed, IOA checks for Student Four failed to achieve a desired overall reliability of 90% or higher. Despite only achieving an IOA coefficient of 59.3% overall, visual analyses of the Student Four's data suggests a possible pattern of behavior.

For all periods, with the exception of period 3, Student Four engaged in problem behavior approximately 50%
<table>
<thead>
<tr>
<th>STUDENT #4</th>
<th>WEEK 1</th>
<th>WEEK 2</th>
<th>WEEK 3</th>
<th>WEEK 4</th>
<th>WEEK 5</th>
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</tbody>
</table>

**Figure 6.** Data on scatter plot for Student Four as collected by each teacher.
or more of all recorded intervals. Table 7 presents data percentages for Student Four. Like Student Two, Student Four had also been placed on the EXCEL waiting list by CAT.

Table 7.

<table>
<thead>
<tr>
<th>Class Percentage of Target Behavior</th>
<th>Recordings Per Rate Category (Student 4)</th>
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<tbody>
<tr>
<td>Class Period</td>
<td>Teacher #</td>
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<tr>
<td>1</td>
<td>10</td>
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<tr>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>3</td>
<td>6</td>
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<tr>
<td>adv.</td>
<td>10</td>
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<tr>
<td>4</td>
<td>7</td>
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<tr>
<td>5</td>
<td>3</td>
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<tr>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>7</td>
<td>12</td>
</tr>
</tbody>
</table>

For Student Four, periods 2 (reading) and 3 (art) involved only one interval in which a high occurrence of inappropriate behavior was recorded. The scatter plot indicated an almost constant rate of 1-2 occurrences of problem behavior per interval for all but 2 of the class periods. For the advisory period and period 7, Student Four had respectively an 18.7% and 31.4% average of intervals in which 3 or more occurrences per interval were recorded. The high percentage of occurrence during the advisory period coincides with that of Student Three, Student Four's classmate during that particular class period. While most of the Student Four's classes included a previously established classroom routine, period 7 did not. During this time the student was either required to stay in the classroom for a self-initiated, teacher-facilitated, study skills
improvement program or to attend a school sponsored math tutoring session.

**QUESTIONNAIRE**

**Question 3:** How will the 13 teachers respond to this study?

A questionnaire was developed and administered to assess the teachers' perceptions. The 29 items related to implementation of the scatter plot, the target behaviors, and the overall usefulness of the pretreatment assessment procedure.

Upon completion of the study, the questionnaire was administered to all 13 teachers. Results of the questionnaire suggest that the teachers in the present study are of the opinion that the scatter plot may be a viable instrument in assessing the behavior of middle school students. According to the responses given, a majority of the teachers felt that the directions for recording the data were clear and concise, and that the format of the data sheet allowed for occurrences of the target behaviors to be easily recorded. Most also felt that, in addition to the target behaviors being easily identifiable, the target behaviors were relevant to their class(es).

Responses also indicate that, during the actual observation period, the teachers were generally unable to identify classroom activities and/or times of day in which occurrences of the target behaviors were likely to decrease
or increase. However, responses to these same items, after the data had been presented, indicate that the scatter plot may have enabled teachers to better identify the classroom activities and times of day in which the problem behaviors were likely to occur. Additionally, a majority of the teachers also seemed to agree that implementation of this pretreatment assessment procedure would enable them to become more aware of a student's behavior.

When asked if the data collected with the scatter plot would be effective in planning classroom management programs for the type of student(s) observed, the teachers generally agreed that the procedure would be effective. However, when asked if they would use the scatter plot assessment procedure in developing future classroom management programs, the teachers were somewhat undecided.

Results of the teacher questionnaire indicated that overall, most teachers were positive about the effectiveness of the scatter plot, but were unclear about specific questions pertaining to the length of each interval and the number of target behaviors recorded per interval. A majority also felt that recording the occurrences had not affected their teaching or the behavior of the student. When asked if recording the data had enabled them to identify particular activities and/or times in which the occurrence of the target behaviors were likely to increase or decrease, the teachers appeared to be unsure. Yet, when asked if they felt
that future applications of the scatter plot would enable them to identify times of day in which occurrences of the target behaviors would occur, most seemed to respond affirmatively. Most also seemed to agree that the scatter plot would be effective in planning classroom management programs for the type of student(s) observed in the study, but they did not feel as strongly about possible utilization of the instrument in the future. If further investigations prove their responses to be valid, utilization of the scatter plot could lead to an improvement in overall teacher performance - the goal of the new Professional Development Appraisal System (PDAS) and, more specifically, Domain IV (Management of Student Discipline, Instructional Strategies, Time, and Materials).

Responses to all survey items are listed in Table 8. The number of teachers responding to each item, the mean, and the standard deviation are presented. Written responses to item 29 can be found in Appendix B.

LIMITATIONS

Assessments. Although it was known to the researcher that data collected over a brief period of time may lack the necessary information for extensive interpretation (Kazdin, 1989), already existing discipline programs within the school made it impossible to continue further data collection for two of the four students. Because of the constant problems of behavior exhibited before and during
the study by Student Two and Student Four, it was decided by the school's Campus Assessment Team (CAT) that immediate placement in a self-contained, in-school suspension program was necessary. Each student would remain in the program for a minimum of four weeks and until the necessary points were earned for exit. It was also made known to the researcher after week 4 that Student Three was expected to be absent for a minimum of two weeks due to knee surgery. In addition to student absences, teacher absences were also a factor.

Participants. Because the "team" concept was only in place in the seventh-grade level, the researcher was only able to observe students within this grade level. Due to reasons concerning meeting times, a willingness to participate, and a broad range of teacher experience, only those teachers/students on one of the three existing teams which averaged approximately 120 students per 5 core teachers, 2 elective teachers, and an advisory teacher were selected for data collection. The aforementioned approach, therefore limits the ability to generalize to larger populations.

Target Behaviors. The link between assessment and analysis of the data is based primarily on specific behavioral definitions. In this particular case, because the observed students often exhibited several types of problem behavior, it was necessary to use broad definitions for the behaviors being recorded. Another reason for this approach
were the multiple observations in which teachers often had to observe more than one student per class time. The researcher felt that because the subjects often engaged in various and, at times, the same behavior, it would be difficult for the teacher-observer to recall which occurrence of behavior he or she was to record for that particular student. The broad definitions may have been a contributing factor to the low percentage of IOA obtained.

**Observer Reliability.** Although according to the questionnaire, the students were more than likely not aware of their behavior(s) being recorded by the teacher or the observer, it is known that just the presence of an "outsider" in the classroom can often affect the behavior of some or all of the students.

**Other Possible Confounding Variables**

**Students.** For Student Three, a visit and a speech to all of the students in one class by the student's mother during week three about Student Three's problem behavior may have had some effect on the student's behavior. For Students Two and Four, their awareness about being on the waiting list for the in-school suspension program could have also affected their behavior.
Table 8

Survey Item Responses

<table>
<thead>
<tr>
<th>Item #</th>
<th>Valid</th>
<th>Missing</th>
<th>Mean</th>
<th>Std. Dev</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Directions for recording the data were clear and concise.</td>
<td>13</td>
<td>0</td>
<td>4.85</td>
<td>.38</td>
</tr>
<tr>
<td>2. The format of the data sheet allowed for occurrences of the target behaviors to be recorded easily.</td>
<td>13</td>
<td>0</td>
<td>4.46</td>
<td>.52</td>
</tr>
<tr>
<td>3. Those behaviors identified as &quot;problem&quot; behaviors are relevant to my class(es).</td>
<td>13</td>
<td>0</td>
<td>4.77</td>
<td>.44</td>
</tr>
<tr>
<td>4. The target behaviors were easily identifiable.</td>
<td>13</td>
<td>0</td>
<td>4.46</td>
<td>.66</td>
</tr>
<tr>
<td>5. Distinguishing between the number of occurrences per fifteen minute interval was difficult.</td>
<td>13</td>
<td>0</td>
<td>2.77</td>
<td>1.30</td>
</tr>
<tr>
<td>6. The number of the target behaviors being observed should be increased.</td>
<td>13</td>
<td>0</td>
<td>2.69</td>
<td>.95</td>
</tr>
<tr>
<td>7. The number of the target behaviors being observed should be decreased.</td>
<td>13</td>
<td>0</td>
<td>2.38</td>
<td>.96</td>
</tr>
<tr>
<td>8. The time allotted for each interval (fifteen minutes) should be increased.</td>
<td>13</td>
<td>0</td>
<td>2.69</td>
<td>1.03</td>
</tr>
<tr>
<td>9. The time allotted for each interval (fifteen minutes) should be decreased.</td>
<td>13</td>
<td>0</td>
<td>2.15</td>
<td>.80</td>
</tr>
</tbody>
</table>

(table continued)
<table>
<thead>
<tr>
<th>10. Recording the particular occurrences of student behavior during class, affected my teaching. (yes/no)</th>
<th>Valid</th>
<th>Missing</th>
<th>Mean</th>
<th>Std. Dev</th>
</tr>
</thead>
<tbody>
<tr>
<td>10a. Recording the particular occurrences of student behavior during class, positively affected my teaching.</td>
<td>5</td>
<td>8</td>
<td>3.60</td>
<td>1.52</td>
</tr>
<tr>
<td>10b. Recording the particular occurrences of student behavior during class, negatively affected my teaching.</td>
<td>5</td>
<td>8</td>
<td>3.00</td>
<td>1.58</td>
</tr>
<tr>
<td>11. Recording the particular occurrences of student behavior during class, affected the behavior of the student being observed. (yes/no)</td>
<td>13</td>
<td>0</td>
<td>.31</td>
<td>.48</td>
</tr>
<tr>
<td>11a. Recording the particular occurrences of student behavior during class, positively affected the behavior of the student being observed.</td>
<td>4</td>
<td>9</td>
<td>4.00</td>
<td>.00</td>
</tr>
<tr>
<td>11b. Recording the particular occurrences of student behavior during class, negatively affected the behavior of the student being observed.</td>
<td>4</td>
<td>9</td>
<td>1.75</td>
<td>.50</td>
</tr>
<tr>
<td>12. The presence of the second observer affected my teaching. (yes/no)</td>
<td>13</td>
<td>0</td>
<td>.31</td>
<td>.48</td>
</tr>
<tr>
<td>12a. The presence of the second observer positively affected my teaching.</td>
<td>4</td>
<td>9</td>
<td>3.00</td>
<td>1.83</td>
</tr>
</tbody>
</table>

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<table>
<thead>
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<th></th>
<th>Valid</th>
<th>Missing</th>
<th>Mean</th>
<th>Std. Dev</th>
</tr>
</thead>
<tbody>
<tr>
<td>12b. The presence of the second observer negatively affected my teaching.</td>
<td>4</td>
<td>9</td>
<td>3.00</td>
<td>1.83</td>
</tr>
<tr>
<td>13. The presence of the second observer affected the behavior of the student(s) being observed. (yes/no)</td>
<td>13</td>
<td>0</td>
<td>0.07</td>
<td>0.28</td>
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<tr>
<td>13a. The presence of the second observer positively affected the behavior of the student being observed.</td>
<td>2</td>
<td>11</td>
<td>1.00</td>
<td>0.00</td>
</tr>
<tr>
<td>13b. The presence of the second observer negatively affected the behavior of the student being observed.</td>
<td>1</td>
<td>12</td>
<td>5.00</td>
<td>0.00</td>
</tr>
<tr>
<td>14. Plotting the occurrences of the target behaviors enabled me to identify particular activities which were likely to increase the occurrences of the target behaviors.</td>
<td>13</td>
<td>0</td>
<td>3.46</td>
<td>1.13</td>
</tr>
<tr>
<td>15. Plotting the occurrences of the target behaviors enabled me to identify particular activities which were likely to decrease the occurrences of the target behaviors.</td>
<td>13</td>
<td>0</td>
<td>3.31</td>
<td>1.03</td>
</tr>
<tr>
<td>16. Plotting the occurrences of the target behaviors enabled me to identify particular times of the day in which occurrences of the target behaviors were likely to increase.</td>
<td>13</td>
<td>0</td>
<td>3.38</td>
<td>1.19</td>
</tr>
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</table>

*(table continued)*
<table>
<thead>
<tr>
<th></th>
<th>Valid</th>
<th>Missing</th>
<th>Mean</th>
<th>Std. Dev.</th>
</tr>
</thead>
<tbody>
<tr>
<td>17. Plotting the occurrences of the target behaviors enabled me to identify particular times of the day in which occurrences of the target behaviors were likely to decrease.</td>
<td>13</td>
<td>0</td>
<td>3.38</td>
<td>1.19</td>
</tr>
<tr>
<td>18. Plotting the occurrences of the target behaviors enabled me to develop effective classroom management strategies. (yes/no)</td>
<td>13</td>
<td>0</td>
<td>.62</td>
<td>.51</td>
</tr>
<tr>
<td>18a. The strategies developed caused an increase in the occurrences of the target behaviors.</td>
<td>6</td>
<td>7</td>
<td>1.83</td>
<td>.41</td>
</tr>
<tr>
<td>18b. The strategies developed caused a decrease in the occurrences of the target behaviors.</td>
<td>6</td>
<td>7</td>
<td>4.14</td>
<td>.41</td>
</tr>
<tr>
<td>19. Plotting the occurrences of the target behaviors, enabled me to become more aware of the student's/students' classroom behavior.</td>
<td>13</td>
<td>0</td>
<td>3.92</td>
<td>.95</td>
</tr>
<tr>
<td>20. I feel the data collected with the scatter plot will enable me to identify particular classroom activities which are likely to increase the occurrences of the target behaviors.</td>
<td>13</td>
<td>0</td>
<td>3.54</td>
<td>1.13</td>
</tr>
<tr>
<td>21. I feel the data collected with a scatter plot will enable me to identify particular classroom activities which are likely to decrease the occurrences of the target behaviors.</td>
<td>13</td>
<td>0</td>
<td>3.69</td>
<td>1.03</td>
</tr>
</tbody>
</table>

(table continued)
22. Plotting the occurrences of the target behaviors will enable me to identify particular times of the day in which occurrences of the target behaviors are likely to increase.

   Valid  Missing  Mean  Std. Dev.

   13      0       4.38  .65

23. Plotting the occurrences of the target will enable me to identify particular times of the day in which occurrences of the target behaviors are likely to decrease.

   Valid  Missing  Mean  Std. Dev.

   13      0       4.23  .60

24. Plotting the occurrences of the target behaviors will enable me to become more aware of the student's/students' classroom behavior.

   Valid  Missing  Mean  Std. Dev.

   13      0       4.23  .83

25. Plotting the occurrences of the target behaviors will enable me to develop effective classroom strategies.

   Valid  Missing  Mean  Std. Dev.

   13      0       3.92  .95

26. I feel the data collected with the scatter plot will be effective in planning classroom management programs for the type of student(s) I observed.

   Valid  Missing  Mean  Std. Dev.

   13      0       4.08  1.04

27. Given the opportunity, I feel I would use this instrument in developing future classroom management programs.

   Valid  Missing  Mean  Std. Dev.

   13      0       3.85  1.07

28. Given the opportunity, I feel that with the assistance of another observer I would use this instrument in developing future classroom management programs.

   Valid  Missing  Mean  Std. Dev.

   13      0       3.77  1.09
29. Please make additional comments pertaining to this research project, that you feel are important.
CHAPTER V

IMPLICATIONS AND RECOMMENDATIONS
FOR FUTURE RESEARCH

This field study was an attempt to evaluate the effectiveness of the scatter plot when applied by a group of 13 public middle school teachers. Teachers collected data for four seventh-grade students (one female and three males) who had been identified by their "team" teachers as having high occurrences of problem behavior. The data were plotted on a scatter plot in 15-minute intervals and coded as either a blank cell for 0 occurrences of the target behaviors, a diagonal line for 1-2 occurrences, and a shaded cell for 3 or more occurrences. Reliability checks were conducted by the researcher, staff, and university students a minimum of 20% of all school days for each subject. Coefficients were then computed to determine the effectiveness of the teachers' application. In addition, a visual analysis of the plotted data was performed to determine if a pattern of behavior existed for each student. Finally, a survey was administered to assess the teachers' perceptions of the scatter plot's effectiveness.

The present study differed from previous studies (Touchette et al., 1985 and Symons, 1992) by observing different behaviors exhibited by a different population in a
different environment. With the exception of one student, the students observed in the present study had not been diagnosed with any particular learning disability or emotional problem. In addition, all students attended "regular" classes of 18 or more students in which each class was taught by a different teacher. Three of the four observed students were enrolled in eight "regular" public school classes which they attended from 8:45 a.m. to 3:45 p.m. The one remaining student attended seven "regular" classes and one special education class per day. The present study also differed in that the students engaged in various types of problem behavior, whereas students observed in the previous scatter plot studies were categorized according to the behavior (a single variable) which they exhibited most often. Because each student exhibited a variety of problem behaviors, the researcher and the core teaching staff were unable to identify only one target behavior per student. It was then agreed that six generally problematic, yet easily identifiable, behaviors would be recorded for each student.

In this chapter, conclusions and implications made from the implementation of the pretreatment assessment procedure known as the scatter plot will be discussed. Recommendations for future research will follow.

Implications for Practice

In this section the implications of the pretreatment assessment procedure known as the scatter plot when applied
in a public school environment are discussed. Educational and practical implications are presented.

**Educational Implications.** The findings of this study support an innovative approach to assessing problem behavior in the classroom. An analysis of the temporal distribution of behavior in the classroom environment provides the teacher and others an opportunity to better investigate each case. As a result, teachers are encouraged to focus their attention on the needs of individual students and to adopt student-centered methods of classroom management. The unique components of the middle school concept (i.e. team teaching, teacher-student advisories, etc.) provide opportunities for teachers as well as administrators to develop classroom management techniques that further incorporate behavior-analytic procedures.

Because a behavior analytic approach like the scatter plot emphasizes a proactive atmosphere by collecting data on the behavior of concern and controlling the behavior through external events, schools appear to be an appropriate place in which to promote such procedures. Unlike conventional approaches, which often utilize an overabundance of aversive procedures and fail to even investigate and identify possible "reasons" for the occurrence of problem behavior, approaches like the scatter plot may prove to be a valuable alternative. Such approaches appear to provide educators
with the foundation needed to make educated hypotheses pertaining to problem behavior.

Rather than focusing primarily on the consequences of problem behavior, teachers are now given the opportunity to apply possibly more effective, less aversive interventions by focusing on antecedents or events responsible for a particular student's behavior. Instead of a reactive approach to dealing with problem behavior in the classroom, the scatter plot can provide the necessary data for a proactive approach. By further investigating proactive approaches to dealing with student behavior, educators are then better equipped to make decisions dealing with individual student needs.

Practical Implications. Although the data collected in this study were not used in developing an intervention for each student, the actual application of the scatter plot did establish the possibility in the future of implementing similar instruments in public schools. As a result, future studies utilizing such instruments could be conducted to study time separations (Wahler & Fox, 1981) pertaining to class schedules, correlations of student behavior (Broden, Bruce, Mitchell, Carter, & Hall, 1970), and teacher attention (Hall, et al., 1968; White, 1975; Carnine & Fink, 1978). Furthermore, the application of the scatter plot in an actual classroom (setting) with "normal" students provides behavior analysts more possibilities in which to
apply assessments previously limited to institutions and/or developmentally challenged individuals. Consequently, such investigations could lead to more educators to buy into the benefits of applying these strategies. At present, behavioral techniques in the management of student behavior in public schools is well-documented, but the actual application of these recommended strategies for maintaining appropriate behavior in the classroom appears to be minimal.

FUTURE RESEARCH

The following recommendations for future research studies are made on the basis of the findings and conclusions of this study.

1. Future investigations that will lead educators to discovering functional assessment methods as a means of developing proactive approaches for dealing with problem behavior are necessary.

2. Future research should adapt functional assessment methods, as needed, to better meet the needs of educators and students in the public school classroom.

3. Future research may also consider limiting the number of target behaviors observed to one behavior per student.

4. Additional studies should consider utilizing the school's paraprofessionals, not teachers, as primary observers in an effort to achieve a higher percentage of inter-observer agreement.
5. Future studies that are able to obtain an IOA of 90% or higher may consider the development and implementation of an intervention based on the collected data.

6. Future studies should attempt to have the school's administration temporarily suspend (for subjects only) already existing disciplinary procedures in an effort to further investigate the effectiveness of the scatter plot.

7. Future studies should be conducted in additional elementary, middle, and/or high schools located in a rural or urban area so as to better determine the effectiveness of the scatter plot in different environments.

8. Future research should also consider utilizing more formal approaches (experimental analyses) to better understand student behavior.

Concluding Remarks

The scatter plot assessment method as used in the present study suggests that the instrument can possibly guide teachers and staff in making decisions pertaining to problem student behavior, but it also warrants further study. The inability to achieve and maintain a 90% level of inter-observer agreement/reliability should be considered.

Despite the previously mentioned factor, the patterns of responding shown in this study and the data collected from the teacher questionnaire do appear to provide a basis for further research involving the scatter plot. More importantly, although reliability coefficients reflected a
low percentage of inter-observer agreement, implementation of the scatter plot gave teachers the opportunity to explore behavior analytic procedures while attempting to better understand student behavior.

In certain situations, utilization of the scatter plot allows the teacher to replace, when appropriate, overly used punishment procedures with procedures which tend to be less aversive and more proactive. As a result, the proactive procedures may have a stronger, longer-lasting effect on student behavior than overly used reactive procedures. Making accessible to teachers pretreatment procedures like the scatter plot, which is adaptable to almost any setting and requires minimal training, is extremely important when one considers the increasingly diverse populations of public schools.

Past research has proved that regardless of a student's socioeconomic status, race, or level of parental education, behavior analytic procedures work. Yet the demonstrated effectiveness of these behavioral strategies is often ignored by the educational establishment. As stated by Axelrod (1991), in an effort to have behavioral strategies benefit students, one must look at the educational process as a two-step operation. First, it is necessary to find educational strategies that work (which has already been accomplished); second, it is necessary to find ways of getting educators to use these procedures. In doing so,
educators will be better equipped to meeting the behavioral needs of each child.
APPENDIX A

TEACHER QUESTIONNAIRE
Demographics

Directions:
Please circle the appropriate response or provide the information as directed.

1. Enter your identification (initials): __________

2. Gender:
   1. Female
   2. Male

3. Age ______

4. Ethnicity
   1. Afro-American
   2. Hispanic
   3. Caucasian
   4. Asian-American
   5. Other

5. Enter the number of years of teaching experience: __________

6. What is your highest degree?
   1. B.A./B.S./B.B.A.
   2. Masters
   3. Doctorate
   4. All course work but dissertation

7. From what college department was your highest degree awarded?
   ____________________________

8. What was the total number of students you observed?
   1  2  3  4

9. What was the maximum number of students observed by you during any given class period?
   1  2  3  4
Scatter Plot Questionnaire

Directions: Please circle the appropriate response or provide the information as directed.

1. Directions for recording the data were clear and concise.
   - strongly agree  agree  undecided  disagree  strongly disagree

2. The format of the data sheet allowed for occurrences of the target behaviors to be recorded easily.
   - strongly agree  agree  undecided  disagree  strongly disagree

3. Those behaviors identified as "problem" behaviors are relevant to my class(es).
   - strongly agree  agree  undecided  disagree  strongly disagree

4. The target behaviors were easily identifiable.
   - strongly agree  agree  undecided  disagree  strongly disagree

5. Distinguishing between the number of occurrences per fifteen minute interval was difficult.
   - strongly agree  agree  undecided  disagree  strongly disagree

6. The number of the target behaviors being observed should be increased.
   - strongly agree  agree  undecided  disagree  strongly disagree

7. The number of the target behaviors being observed should be decreased.
   - strongly agree  agree  undecided  disagree  strongly disagree
8. The time allotted for each interval (fifteen minutes) should be increased.
   strongly agree  agree  undecided  disagree  strongly disagree

9. The time allotted for each interval (fifteen minutes) should be decreased.
   strongly agree  agree  undecided  disagree  strongly disagree

10. Recording the occurrences of the target behaviors during class, affected my teaching.
    yes no

If you answered "yes" to question 10, please answer questions 10a and 10b. If not, continue with question 11.

10a. Recording the occurrences of the target behaviors during class, positively affected my teaching.
     strongly agree  agree  undecided  disagree  strongly disagree

10b. Recording the occurrences of the target behaviors during class, negatively affected my teaching.
     strongly agree  agree  undecided  disagree  strongly disagree

11. Recording the occurrences of the target behaviors during class, affected the behavior of the student being observed.
    yes no

If you answered "yes" to question 11, please answer questions 11a and 11b. If not, continue with question 12.

11a. Recording the occurrences of the target behaviors during class, positively affected the behavior of the student being observed.
     strongly agree  agree  undecided  disagree  strongly disagree
11b. Recording the occurrences of the target behaviors during class, negatively affected the behavior of the student being observed.

strongly agree agree undecided disagree strongly disagree

12. The presence of the second observer affected my teaching.

yes no

If you answered "yes" to question 12, please answer questions 12a and 12b. If not, continue with question 13.

12a. The presence of the second observer positively affected my teaching.

strongly agree agree undecided disagree strongly disagree

12b. The presence of the second observer negatively affected my teaching.

strongly agree agree undecided disagree strongly disagree

13. The presence of the second observer affected the behavior of the student(s) being observed.

yes no

If you answered "yes" to question 13, please answer questions 13a and 13b. If not, continue with question 14.

13a. The presence of the second observer positively affected the behavior of the student being observed.

strongly agree agree undecided disagree strongly disagree

13b. The presence of the second observer negatively affected the behavior of the student being observed.

strongly agree agree undecided disagree strongly disagree

14. Plotting the occurrences of the target behaviors enabled me to identify particular classroom activities which were likely to increase the occurrences of the target behaviors.

strongly agree agree undecided disagree strongly disagree
15. Plotting the occurrences of the target behaviors enabled me to identify particular classroom activities which were likely to decrease the occurrences of the target behaviors.  

    strongly agree  agree  undecided  disagree  strongly disagree

16. Plotting the occurrences of the target behaviors enabled me to identify particular times of the day in which occurrences of the target behaviors were likely to increase.  

    strongly agree  agree  undecided  disagree  strongly disagree

17. Plotting the occurrences of the target behaviors enabled me to identify particular times of the day in which occurrences of the target behaviors were likely to decrease.  

    strongly agree  agree  undecided  disagree  strongly disagree

18. Plotting the occurrences of the target behaviors enabled me to develop effective classroom management strategies.  

    yes  no

If you answered "yes" to question 18, please answer questions 18a and 18b. If not, continue with question 19.

    18a. The strategies developed caused an increase in the occurrences of the target behaviors.  

        strongly agree  agree  undecided  disagree  strongly disagree

    18b. The strategies developed caused a decrease in the occurrences of the target behaviors.  

        strongly agree  agree  undecided  disagree  strongly disagree

19. Plotting the occurrences of the target behaviors, enabled me to become more aware of the student's/students' classroom behavior.  

        strongly agree  agree  undecided  disagree  strongly disagree
20. I feel the data collected with a scatter plot will enable me to identify particular classroom activities which are likely to increase the occurrences of the target behaviors.

   strongly agree  agree  undecided  disagree  strongly disagree

21. I feel the data collected with a scatter plot will enable me to identify particular classroom activities which are likely to decrease the occurrences of the target behaviors.

   strongly agree  agree  undecided  disagree  strongly disagree

21. Plotting the occurrences of the target behaviors will enable me to identify particular times of the day in which occurrences of the target behaviors are likely to increase.

   strongly agree  agree  undecided  disagree  strongly disagree

22. Plotting the occurrences of the target behaviors will enable me to identify particular times of the day in which occurrences of the target behaviors are likely to decrease.

   strongly agree  agree  undecided  disagree  strongly disagree

23. Plotting the occurrences of the target behaviors will enable me to identify particular times of the day in which occurrences of the target behaviors are likely to decrease.

   strongly agree  agree  undecided  disagree  strongly disagree

24. Plotting the occurrences of the target behaviors will enable me to become more aware of the student's/students' classroom behavior.

   strongly agree  agree  undecided  disagree  strongly disagree

25. Plotting the occurrences of the target behaviors will enable me to develop effective classroom strategies.

   strongly agree  agree  undecided  disagree  strongly disagree
26. I feel the data collected with a scatter plot will be effective in planning classroom management programs for the type of student(s) I observed.

   strongly agree  agree  undecided  disagree  strongly disagree

27. Given the opportunity, I feel I would use this instrument in developing future classroom management programs.

   strongly agree  agree  undecided  disagree  strongly disagree

28. Given the opportunity, I feel that with the assistance of another observer I would use this instrument in developing future classroom management programs.

   strongly agree  agree  undecided  disagree  strongly disagree

29. Please make additional comments pertaining to this research project, that you feel are important.
APPENDIX B

RESPONSES TO ITEM 29 OF QUESTIONNAIRE
Teacher Comments

Teacher 2: The problem was always the distraction of the 15-minute time interval. I do not think this study takes in account the good/poor discipline of the teacher.

Teacher 3: Thanks for the opportunity.

Teacher 5: Good job!

Teacher 6: I feel the end product can be very useful in team situations. The process is a little time consuming but the rewards may outweigh the negatives.

Teacher 7: I think that this would be a good device to use at the start of the year, middle, and end to see how they develop over the year.

Teacher 8: This was a useful tool in learning to look for specific behaviors.

Teacher 9: The student whom I observed is a behavior problem for all. Where there was a high concentration on the scatter plot, the student was in a very large class with many other behavior problems.

I found this observation technique more of a distraction for the class and also for the teacher. It was a burden to stop and check the time; fill in the sheet during a lesson. This interrupted my teaching.

Teacher 10: I think this instrument is a very good way to see one "big" picture. It was interesting to see the collected data and have the opportunity to discuss with other teachers our concerns and reasoning.
Teacher 11: The two students I observed were without incident. I think you should cross years of teaching experience with incidents of bad behavior. That would be a variable of great importance.

I don't think advisory should be included because it is loosey goosey and no grade is given.

When I said years of teaching experience, I mean years of teaching experience with effective classroom management already in place.

Teacher 12: I feel that this monitoring definitely helps identify student behaviors in the classroom and will aid in classroom structure and discipline!
APPENDIX C

LETTER FROM THE PRINCIPAL TO THE UNIVERSITY
January 29, 1998

University of North Texas
Institutional Review Board

Angelo Alcala, a teacher in my building and graduate student at the University of North Texas has fully discussed his research proposal and project with me. I have given permission to conduct this study and the teachers and students have been selected. He will continue to keep me informed of the progress and will share results with me at the close of the study. All appropriate authorization and documentation have been secured.

Sincerely,

Principal
APPENDIX D

LETTER FROM THE INSTITUTIONAL REVIEW BOARD
February 12, 1998

Mr. Angelo Alcala
2963 Magnolia Hill Ct.
Dallas, TX 75201

Re: Human Subjects Application No. 98-015

Dear Mr. Alcala:

As permitted by federal law and regulations governing the use of human subjects in research projects (45 CFR 46), I have conducted an expedited review of your proposed project titled "Application of the Scatter Plot Graph In A Public Middle School." The risks inherent in this research are minimal, and the potential benefits to the subjects outweigh those risks. The submitted protocol and informed consent form are hereby approved for the use of human subjects on this project.

The UNT IRB must re-review this project prior to any modifications you make in the approved project. Please contact me if you wish to make such changes or need additional information.

If you have questions, please contact me.

Sincerely,

Walter C. Zacharias, Jr., Ed.D.
Chair, Institutional Review Board

cc: IRB Members
REFERENCES


Bijou, S. W., Peterson, R. F., & Ault, M. H. (1968). A method to integrate descriptive and experimental field
studies at the level of data and empirical concepts. *Journal of Applied Behavior Analysis*, 1, 175-191.


Journal of the Experimental Analysis of Behavior, 37, 149-155.


