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Effects of self-monitoring on the academic performance and on-task behavior of students with learning disabilities

Abbott, Susan R., Ph.D.
The Ohio State University, 1990

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EFFECTS OF SELF-MONITORING ON THE ACADEMIC PERFORMANCE
AND ON-TASK BEHAVIOR
OF STUDENTS WITH LEARNING DISABILITIES

DISSERTATION

Presented in Partial Fulfillment of the Requirements
for the Degree Doctor of Philosophy in the Graduate
School of The Ohio State University

By

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Dr. Timothy E. Heron
Advisor
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1990
To My Parents
Mr. and Mrs. Thomas R. Abbott
Who Throughout My Entire Program
Have Remained
"The Wind Beneath My Wings"
ACKNOWLEDGEMENTS

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CHAPTER I

INTRODUCTION

We value self-control because of its role in the survival of our society and culture. One measure of a "civilized" society is the degree to which its inhabitants direct, maintain, and coordinate their activities without external coercion. If more individuals could develop effective self-management skills, the need for professional helpers and the number of passive "you help me" patients might be sharply diminished. (Mahoney & Thoresen, 1974, p.1)

Self-control (self-management as it will be referred to in this dissertation) is a valued skill in our society. According to Dewey (1939) "The ideal aim of education is the creation of self-control". Students who acquire self-management skills are able to maintain appropriate behavior and change it when necessary, even when teachers and parents are not directly involved. The greater the extent to which students are able to maintain their own behavior, the less time will be required by teachers on management of related behaviors, and the more time can be spent on improving the quality of instruction.

Many students with learning disabilities have a difficult time with the academic task demands in the classroom setting.
Although students with learning disabilities may demonstrate proficiency with the specific behaviors necessary for successful task completion, research has shown that they do not always use these skills consistently (Torgesen, 1980). As a result, their academic performance is often hard to interpret and maintenance of mastery levels is difficult to obtain.

According to Dunlap and Dunlap (1989), a major emphasis of educational and behavioral research has been to identify instructional strategies that serve to increase student ability to learn and perform academic tasks in a consistent and timely manner. One such procedure is self-monitoring.

Self-monitoring is a technique that engages a student actively in the self-assessment of a target behavior in order to increase an appropriate behavior or decrease an inappropriate behavior. The procedure requires the individual to self-observe and self-record occurrences or nonoccurrences of targeted behaviors. Self-monitoring procedures are easy to implement, inexpensive, and effective. Research has shown that self-monitoring procedures can help students with learning disabilities improve attentional behavior and academic performance (Harris, 1986; Lloyd, Bateman, Landrum, & Hallahan, 1989; Rooney, Polloway, & Hallahan, 1985).
PURPOSE OF THE STUDY

This study examined the effects of self-monitoring with and without an audio cue as a method to increase academic production and attention with five learning disabled (LD) students in two special education environments (study skills and math) in a suburban public middle school. During self-monitoring in the study skills, students were required to assess and record their academic production behavior at a audio cue "record". Generality was assessed in the math setting by observing the students assess and record their academic production in the absence of an audio cue.

RESEARCH QUESTIONS

The following research questions were addressed in this study:

1. Will self-monitoring result in a higher rate of academic production over a baseline condition in which students did not self-monitor their academic production?

2. Will self-monitoring result in a higher percentage of on-task behavior over a baseline condition in which students did not self-monitor their academic production?

3. Will student on-task behavior after self-management training be maintained in the absence of an audible cue?
4. Will student on-task behavior after self-management training extend to another setting?

5. Will students record their rate of academic production accurately?

6. What type and with what frequency did teacher behaviors occur during baseline and self-monitoring conditions?

7. Will the teachers and students satisfied with self-monitoring as a behavior-change technique?

**Terminology**

Special terms used in this study are listed below.

**SLD student.** A student in the study who was identified as having specific learning disabilities (SLD) according to the rules of the Ohio State Department of Education and who received some of his or her daily academic instruction in a resource room for SLD students.

**Academic production.** Academic production was defined as the student's rate of performance on (a) prepared worksheets in the study skills SLD classroom, and (b) prepared worksheets in the mathematics SLD classroom. The unit of measurement for productivity was rate as defined by student movement. A movement was considered to be a letter, numeral, or mark written in the answer space to a question or problem. This unit
was used because it provided a consistent measure of performance across problems of differing levels of difficulty. Rate was equal to the number of responses (movements) divided by time. Time remained constant during the study (10 minutes).

**On-task behavior.** On-task behavior was defined as the student being engaged actively in looking at his or her assigned study skills or mathematics work and holding his or her pencil in a writing or erasing position.

**Off-task behavior.** A student was off-task when he or she held other objects, used their hands in some other activity, or was looking around the classroom.

**Self-monitoring.** Self-monitoring refers to a procedure in which an individual recorded target behaviors regularly, and noted the extent to which criterion on those behaviors was achieved.

**Teacher-student interactions.** Teacher-student interactions were defined as (a) positive interaction (e. g., teacher performs actions such as making positive comments, providing, redirective statements or constructive feedback, placing a hand on student's shoulder etc.), (b) negative interaction (e. g., teacher admonishes, or chastises student), or (c) no/neutral interaction (e. g., no interaction, or interaction not based on instructional activity).
Accuracy of self-monitoring. Accuracy of student self-monitoring was assessed by comparing the student's academic production recording forms with the experimenter's on a daily basis for each session. The total number of items completed was assessed using the worksheets as permanent products and the students total number of items recorded for each session was compared with the total number of items the observer recorded.

Generality of self-monitoring. Generality referred to the extent to which students accurately self-recorded their rate of academic production in the math setting in the absence of an audible cue.

Students' and teachers' opinions. Students' and teachers' opinions were obtained using student and teacher responses on an exit interview administered following the last phase of the study. These surveys were administered by an independent observer, and served as a measure of social validity.

Student recording sheet. The student recording sheet was a form containing spaces for name, date, class, and intervention number. Each sheet also contained 10 boxes for students to record their academic production and spaces for their rate per minute total.

Master recording sheet. The master recording sheet was a form consisting of a single sheet with spaces for the date,
intervention number, class, and percentage, plus codes for recording each of the students' behavior and teacher-student interactions. The master sheet listed the on-task behaviors and the categories for teacher-student interactions. This master sheet was also used by outside observer.

**Permanent products.** Permanent products were worksheets that the students completed during the 10 minute sessions. One worksheet was a study skills assignment and one work sheet was a math assignment.

**Exit interview forms.** Exit interview forms were prepared forms for the students' and teachers' opinions duplicated by the experimenter and distributed to the students and teachers by an independent observer at the end of the study.

**Procedural reliability check lists.** Procedural reliability checklists were lists used by outside observers to ensure that procedures were implemented as intended. One checklist was for training; one for self-monitoring sessions.

**Parental consent form.** Parental consent forms were prepared forms signed by a parent or guardian for each student who took part in the study.

**Training script.** The training script was a prepared script used for teaching the students the recording process to ensure that all subjects received the same instruction.
Pre-recorded audio-tapes. Two pre-recorded audio tapes were used one for the experimenter and observer, and one for the students. The audio tape for the students contained a variable interval cue of "record" and ranged from 30-seconds to 90-seconds. The prerecorded audio-tapes were precalibrated and verified by an independent observer who did not know the actual times when the cue was scheduled to be emitted.
CHAPTER II

REVIEW OF LITERATURE

This chapter discusses the relevant literature associated with implementing self-management programs in applied settings. Central to the discussion are such topics as self-control, definitions, advantages, and techniques of self-management, generality of behavior change, and social validity.

Self-Control

In Skinner's classic book *Science and Human Behavior* (1953), he devotes a chapter to self-control, applying the philosophy and theory of radical behaviorism to actions typically considered to be under the control of the self. According to Skinner's operant conditioning model of self-control:

When a man controls himself, chooses a course of action, thinks out the problem, or strives toward an increase in self-knowledge, he is behaving. He controls himself precisely as he would control the behavior of anyone else... through manipulation of variables of which behavior is a function. His behavior in so doing is a proper object of analysis, and eventually it must be accounted for with variables lying outside the individual himself. (pp. 228-229)
This approach can be summarized by saying that if a person wants a specific behavior from himself, he should set up the conditions which he knows will control it (Goldiamond, 1965).

Workman and Hector (1978) reviewed 13 research articles that used behavioral self-control procedures with students in elementary and secondary classroom settings. They found that behavioral self-control procedures appeared to be promising with on-task and academic behaviors, but the data were inconclusive with respect to disruptive behaviors. O'Leary and Dubey (1979) reviewed self-control procedures used by children to affect behavior. They concluded that most of the self-control techniques, when implemented alone, have enabled some children to control academic and social behaviors successfully. They noted that self-control procedures were probably as effective as similar externally imposed procedures, especially given the likelihood of maintenance effects. Also, they stated that effective self-control teaching methodologies warrant further research. In their view, children must be taught, not just told, to use self-controlling skills and the child's history must prepare him or her to use self-control procedures.

Definitions of and Rationale for the Use of Self-Management

Various terms have been used in the literature to refer to self-management (e.g., self-control, self-modification, self-
regulation). For the purpose of this study, self-management will be used as a generic term. That is, self-management will be defined as the personal application of behavioral principles to modify a certain aspect of one's behavior.

Kazdin (1975), for example, defined self-management as the application of behavioral principles to modify one's own behavior. Cooper, Heron, and Heward (1987) defined self-management as the "Personal and systematic application of behavior change strategies that result in the desired modification of one's own behavior" (p. 517). Thus, self-management, involves at least two responses: (a) the response to be controlled; and (b) the response(s) emitted in order to control the rate of the target behavior.

John Dewey (1939) suggested "...the ideal aim of education is the creation of self-control" (p. 75). Forty-five years later, Kazdin (1984) stated that "The goal of behavior modification is to train an individual to control his or her own behavior and achieve self-selected goals" (p. 195). A person who has self-control, or is able to perform self-management skills, allows himself to be responsible for his own learning, and is capable of functioning independently. Training a person to use self-management skills prepares that person for the future.
Along with parental responsibility, it is the teacher's responsibility to see that students are able to control their lives. Teachers must design programs so that students learn to monitor and reinforce personal growth toward short and long-term goals. The skills that enable a student to develop and maintain independence such as self-management skills have to be taught directly because their appearance in a behavior repertoire often does not happen by chance (Alberto & Troutman, 1986).

According to Rosenbaum and Drabman (1979), establishing effective self-control behavior modification programs in schools would enable children to manage their own academic and social behavior. Effective student self-controlled programs would also enable teachers to devote more time to teaching. In order to maximize the effectiveness of self-control training in the classroom, Rosenbaum and Drabman suggest that once students are taught self-observation procedures, externally administered contingencies for desirable behavior change can be introduced. Control of these external contingencies can be transferred to the students, and along with the self-determined contingencies, students can be taught to provide themselves with instructions and praise designed to guide their behavior. When students can reliably control their academic and social behavior, explicit contingencies should gradually be withdrawn.
Furthermore, this approach could maximize the probability of maintenance of self-management skills after the training program has been removed, and it would also contribute to the potential generalization of these skills across different situations. Future research may demonstrate that accurate self-observation will increase the efficiency of self-control training.

Although self-management is a valued skill in our society, it has rarely been addressed directly by the educational system. Lovitt (1973) and Stephens (1978) have noted the educational paradox: While a major goal of the educational system is the creation of independent and self-reliant individuals, self-management skills are not systematically programmed in this system. In order to achieve the ideal goal of creating self-reliant and independent individuals, teachers should be able to model and teach students those skills.

Cooper et al. (1987) also suggest advantages that contribute to the overall rationale for using self-management in applied settings: (a) external change agents can miss important behavior, and in some instances external change agents are not available in the environment; (b) generalization is promoted, and for a behavior change to be meaningful generalization must take place; (c) personalization of behavior goals occurs, a student may be more successful in changing a behavior when he
or she has input into what behavior should be changed, and how the behavior should be changed; (d) classroom efficiency is improved, if students can monitor their own behavior the teacher's time can be used to remediate other student's behavior; (e) functional independence is obtained, if students can effectively use self-management skills they can have more control of their own behavior and in turn will have more control over their lives, resulting in a sense of accomplishment; and (f) additional skills are taught, teaching self-management skills supports and gives meaningful practice to other parts of the school curriculum. Individually and collectively these advantages are compelling, meaning that practitioners searching for functional appropriate methodologies would find sufficient justification for using self-management procedures in applied settings.

In summary, self-management techniques are viable options over other behavior change procedures because self-management techniques provide an opportunity for changing behavior on a large scale that would not be achieved easily with other techniques. There are many different self-management strategies that can be used to modify behavior. According to Alberto and Troutman (1982), a person could use almost any one of them to modify his or her own behavior.
SELF-MANAGEMENT TECHNIQUES

In 1953 B. F. Skinner suggested that a person could use specific skills to change his or her own behavior. Some of the techniques that Skinner suggested are available to the individual to exercise self-management (self-control) are: (a) employing physical restraints and aids that help the individual to avoid some form of punishment or to achieve some reward more easily (e.g., removing oneself from the situation); (b) changing the stimulus involves identifying the eliciting or discriminating stimuli for the desired or undesired response and seeing that they are presented or removed from the situation whichever is appropriate; (c) applying deprivation and satiation directly to the response to be elicited or extinguished, or applied to the competing response. An example that Skinner uses is that of an individual who has a habit of nail-biting, is instructed to intentionally bite his or her nails to the point of satiation; (d) manipulating emotional conditions involves a variety of measures, both symbolic and physical, which lead to changes in emotional states (e.g., counting to 10 when angry); and (e) using aversive stimulation is offered in both concrete and symbolic forms for controlling behavior (e.g., setting alarm clocks, emitting self statements such as "get up"). Other suggestions offered by Skinner include operant conditioning, punishment, the use of drugs, and "doing something else".
Kanfer (1977) has suggested a model of self-management that requires the individual to first of all make a commitment to change a behavior and then set a standard or criterion of behavior change as a goal. Once a goal has been set, the individual self-monitors or self-evaluates the behavior in question. When the behavior reaches the standard or criterion the individual then administers a self-reward(s).

A related model of self-management has been suggested by Thoresen and his colleagues (Thoresen & Coates, 1976; Thoresen & Mahoney, 1974; Thoresen, Gray-Kirmil, & Crosbie, 1977). Like the Kanfer model, the Thoresen model emphasizes the role of self-monitoring, self-evaluation, and self-reinforcement. The Thoresen et al. model embraces such concepts as "contingency rules" to explain the guidance of behavior in the absence of, or sometimes despite, contrary pressures from the external situation. These contingency rules or plans provide the individual with the kinds of behavior that are appropriate or expected under particular conditions, the performance levels (standards) the behavior must achieve, and the consequences for reaching or failing to reach stated standards.

Cooper et al. (1987) suggest that self-management techniques rarely involve only one principle of behavior and are most often employed as a package. However as discreet
techniques they can be categorized according to the three term contingency (i.e., antecedent stimulus, response, and consequence): The first class involves several antecedent stimulus control techniques. The individual learns to engage in behaviors that precede the target behavior -- the behavior to be changed. Stimulus interventions involve environmental manipulations that alter some critical aspect of the antecedent conditions associated with the target behavior (Cooper et al., 1987) Stimulus control strategies are sometimes referred to in the self-management literature as environmental planning which involves providing extra cues or confronting oneself with stimuli that will control the target behavior, or prearranging the environment so that either the cues that precede a behavior or the consequence that follow it are changed.

The second class of self-management techniques involves the target behavior itself and includes self-monitoring. Self-monitoring of attention is a procedure whereby students periodically ask themselves, "Am I paying attention?" In this case, self-monitoring consists of two stages. First, the student has to assess his behavior and decide if a particular behavior occurred. Second, the student records the occurrence or nonoccurrence of that behavior (Nelson et al., 1981).

The third class of self-management techniques involves self-initiated consequential control and includes self-
reinforcement and self-punishment. Skinner (1953) defined self-reinforcement as the administration of reinforcing stimulus by the organism itself contingent upon emitting a particular response. Self-punishment is a condition whereby a person self-administers a stimulus which weakens the behavior that it follows (Thoresen & Mahoney, 1974).

Self-Monitoring

Self-monitoring, self-recording, self-observation, and self-assessment are described in the self-management literature almost synonymously. These techniques refer to systematically observing and recording one's own behavior. Self-monitoring has been called "the lifeblood of effective self-control methods" (Thoresen & Mahoney, 1974).

Self-monitoring involves the target behavior itself and may include stimulus control and consequential control. Self-recorded data provide the individual with immediate and precise feedback on the frequency, intensity, or duration of the behavior. It is cost effective compared to hiring trained observers, and it is a valuable method of obtaining information on private, inaccessible behaviors. As Skinner (1974) stated, "The person with whom we are most familiar is ourself" (p. 7). In addition, self-recording minimizes the unwanted effects of observers being present in the instructional setting.
In the past, self-monitoring was used primarily as a means of gathering baseline data (Kazdin, 1974), however, because of its frequently produced reactive effect, self-monitoring can function as a behavior change technique (Rosenbaum & Drabman, 1979). Reactivity refers to the "effects on a subject's behavior produced by an assessment or measurement procedure" (Cooper et. al., 1987, p. 524). The more obtrusive the observation method, the greater the likelihood of reactivity (Kazdin, 1974).

According to Lalli and Shapiro (1990) three theories have been proposed to account for the reactive effects of self-monitoring. Kanfer's (1977) cognitive-behavioral model accounts for reactive effects through a multi-stage model of regulation. The components of the self-management process occur as a sequence of events. The reactive chain leads to the person comparing self-monitored behavior against a performance criterion, and when performance equals or surpasses the criterion leads to self-reinforcement. The operant recording response model (Rachlin, 1974) and the multiple cueing stimuli model (Nelson & Hayes, 1981) both take into account the importance of environmental contingencies to reactive self-monitoring. Variables affecting the reactivity of self-monitoring function as discriminative stimuli that acquire controlling properties through association with overt reinforcers or punishers and thus enhance reactive effects.
As a self-management and behavior change technique, self-monitoring has been used successfully with a variety of behavior. Increases have been noted in paying attention in the classroom (Broden, Hall, & Mitts, 1971; Kneedler & Hallahan, 1981), academic responses (Hundert & Bucher, 1978; James, Trap, & Cooper, 1977). Decreases have been noted in talk outs and aggression in the classroom (Lovitt, 1973).

One of the first studies to use self-monitoring was conducted by Broden, Hall, and Mitts (1971). They documented improved study behavior in an eighth grade girl in history class as a result of self-recording. During intervention, the girl was directed to record on a slip of paper whether or not she studied in class. She marked a plus (+) for studying and a minus (-) for not studying. This self-monitoring technique resulted in an increase in studying, however when the slips were withdrawn, study behavior decreased, and did not increase until the self-recording procedure was reinstated. After teacher praise for study was increased, self-recording was discontinued without significant losses in study behavior. In the final phase of the study, increased teacher praise was also withdrawn and studying remained at a high level.

In their second experiment, Broden et al. (1971) recorded the number of talk outs of an eighth grade boy during math class. He was directed to mark on a slip every time he talked
out. Talk outs decreased when self-recording was in effect and increased again when self-recording was withdrawn. However, when self-recording was reinstated during the final phase of the study, there was a slight, although not a significant, decrease in talk outs as compared to the initial baseline condition.

Lovitt (1973) used self-recording to reduce the number of talk outs with a nine-year-old girl. A card was taped to the girl's desk and she was to record her own talk-outs. Each time she spoke out of turn she made a tally mark on the card. If the girl forgot to tally when she talked out, she was reminded by the teacher. Self-recording resulted in decreased talk outs. During 50 percent of the days observed, no talk outs were noted, during a 4-day period only one talk out was observed.

In another study, Lovitt (1973) found self-recording to be an effective, but punishing event. Self-recording had a positive effect on hitting behaviors; it resulted in elimination of the target behavior. However, the subject in his study "tore up his tally sheet and announced he would no longer record his hits!" (p. 22).

McLaughlin (1983) conducted a study with three behavior disordered students aged 8.6 to 9.4 in a self-contained public school classroom. During intervention, students were given a sheet of paper marked with 10 squares per row, with a total of
100 squares per sheet. The students were told to mark a "+" when they were studying (on-task) and a "-" when they were not. No cueing devices or external prompts were employed. This procedure was similar to that employed in other reports (McLaughlin, 1984; McLaughlin, et al., 1981; McLaughlin & Truhlicka, 1983). The overall effect of the procedure can be noted by comparing the on-task behavior during intervention, which ranged from 77% to 98.5% to the on-task behavior during initial baseline conditions which ranged from 33% to 62%. Long term follow-up evaluation revealed maintenance of treatment gains over time. Even though students were not self-recording, on-task behavior continued to stay above baseline means.

In a follow up study, McLaughlin, Krappman, and Welsh (1985) conducted an investigation with behavior disordered students aged 10.2 to 12.3 years. The procedures and the results were similar to the previous study. Results indicated that more pupils were on-task during the self-recording condition than during baseline. To test the long-term effects of the self-recording method, the students were observed after the termination of the self-recording conditions. Follow-up data indicated that the procedures could be withdrawn without a decrement in performance.

Snider (1983) did a review on existing self-monitoring research conducted with LD children. Snider's review focused
mainly on research done by Hallahan and his associates at the University of Virginia who have implemented a series of self-monitoring studies with learning disabled students. The self-monitoring procedures used were an adaptation of techniques that were first used by Glynn and his associates (Glynn & Thomas, 1974; Glynn, Thomas, & Shee, 1973).

In their initial study, Hallahan, Lloyd, Kosieszcz, Kauffman, and Graves (1979) demonstrated the effectiveness of self-monitoring using a tape-recorded beep at random intervals to remind students to ask themselves, "Am I paying attention?" This procedure was a systematic replication of previous successful self-monitoring experiments (Glynn & Thomas, 1974; Glynn et al., 1973; Thomas, 1976). The investigators found that rate of hand-writing and amount of arithmetic seatwork increased.

In order to demonstrate that self-monitoring was an effective intervention during instruction Hallahan et al. (1981) conducted a study with a small group engaged in acquisition of reading comprehension skills. On-task behavior for all three target subjects increased. The results of the study showed that during baseline students were on-task about 20% of the time, whereas during intervention two of the three subjects improved to approximately 80% on-task, and the third subject improved to 50% time-on-task.
In another study, Lloyd, Hallahan, Kosiewicz, and Kneedler (1982) examined the effects of self-assessment versus self-assessment plus self-recording with a 9 year old learning disabled student using one digit multiplication problems. Results indicated that both self-assessment and self-assessment plus self-recording improved on-task behavior compared to no treatment. However, neither treatment was superior to the other. Academic productivity improved initially in both treatment conditions, however a downward trend was noted before the second reversal phase. In the second phase of the experiment, results indicated that on-task levels were higher during the self-assessment plus recording condition as compared to self-assessment only.

Hallahan, Lloyd, Kneedler, and Marshall (1982) examined the effects of self-assessment compared to teacher-assessment of on-task behavior. The self-assessment condition followed the same procedures as previous experiments. In the teacher-assessment condition, the teacher noted the student's behavior when the tone sounded and gave a thumbs-up or thumbs-down signal to the child. The student then recorded the appropriate response. Results indicated the self-cued condition was superior, although both showed a dramatic increase in the production of on-task behavior. In a following study Rooney, Hallahan, and Lloyd (1984), examined the feasibility of using
self-monitoring in the regular classroom during a language arts program.

The subjects in the study were second grade students with learning disabilities placed in a regular classroom. A reversal design was used with the independent variable being self-monitoring cued by recorded tones. Results indicated that on-task behavior doubled when the intervention was in effect. Also, they found that reinforcement of the correct procedure led to greater gains in on-task behavior.

In a study conducted by Blick and Test (1987), effects of self-monitoring on the performance of on-task behavior with 12 mildly handicapped high school students (9 learning disabled, 2 educable mentally retarded, and 1 emotionally handicapped) were examined. Students recorded the occurrence or nonoccurrence of their on-task behavior during four interventions replicating procedures similar to studies done by Hallahan and colleagues. On-task behavior was defined as the student being actively engaged in (a) looking at the teacher, another student or person who was engaged in academic talking, (b) talking with the teacher, (c) reading assigned material, or (d) writing an assignment. Students marked a (+) on the recording sheet if they were on task; all other behaviors were recorded as (0). The first intervention consisted of a 5-minute self-record in which the students recorded their on-task
behavior every 5-minutes to the audio cue "record". The second intervention was a 10-minute self-record, in which the audio cue "record" was sounded every 10-minutes and students continued to mark their behavior. The third intervention was a partially faded cue, self-record in which the students were told to mark their behavior at the sound "record" and also at designated clock times that were on their recording sheets. The verbal cue was delivered at 20 and 40 minutes. As a visual cue, clock times for 10 and 30 minutes into the intervention were written beneath the appropriate blocks on each recording sheet. The final phase consisted of no audio cue, self-record. The students received recording sheets with four blocks, each with clock times at 10-min. intervals added underneath.

Results of the study indicated that functional relationship between self-monitoring and recording and increased on-task behavior existed for both group and individuals. In addition, student on-task behavior maintained at a high level even as audible recording cues were faded. Although not directly measured in this study, academic work increased as evidenced by school records in both the training (resource room) and the nontraining (resource and regular classes).

In a systematic replication of the Blick and Test (1987), Abbott and Heron (1988) conducted a study demonstrating the effects of self-monitoring on the on-task classroom
performance of three junior high school students enrolled in a large urban school district. Measurements were obtained daily across four categories of behavior using a Placheck Recording System (Tawney & Gast, 1984). Blick and Test's (1987) definition of on-task behavior was used throughout the study. During Baseline, an audio tape, encoded with a chime at 5-minute intervals, was played so that an observer could record the students' behavior. Students were not told why the chime sounded. During Training, students were taught to record their behavior at the sound of the audio-cue "record" using a model plus practice format, and they were reminded of the behaviors that constituted on-task. During Intervention 1 (5-minute self record), students recorded at the cue but they were reminded of the behaviors to record every other day. When Intervention 2 (10-minute self-record) was in effect, students recorded their behaviors 4 times per session instead of 8 times. Also, no reminders were provided. During Intervention 3 (partially faded cues, self-record) a third cueing tape was introduced that sounded at the 20 and 40-minute marks. Students continued to record their behaviors at their regular interval by matching the designated time on their recording sheet with clock face time. Finally, during intervention 4 (no audio cue, self-record), students recorded their behaviors on recording sheets each with clock times designated in 10 minute intervals. Across all
interventions, observers continued to record at 5-minute intervals.

The results of this study confirmed Blick and Test's (1987) findings insofar as self-recording increased and maintained student on-task performance, even in the absence of audible cues. A functional relationship between self-recording and improved student performance was established for all three target students. However, the data also indicated that each of the students was subjected to in-school and out-of-school suspensions over the course of the study. Students were suspended for up to 3 days for (a) disobeying the teacher, (b) disrupting another teacher's classroom, or (c) engaging in inappropriate behavior in the hallway of the school. So, while the effect of the interventions was positive and situation specific, the students still came into contact with serious sanctions imposed by the teachers or the principal because of other behaviors they emitted.

According to Hallahan and Sapona (1983) there have been three primary methods of dealing with the attentional problems of learning disabled--stimulus reduction, drugs, and behavior modification. Although each of these have met with some success, the results are not overwhelming. All three of these approaches place the student in a passive recipient of treatment. Self-monitoring on the other hand, emphasizes
having the student participate actively in the treatment process. Along with the student having an active role in his school program, data-based conclusions show self-monitoring of attention during academic work leads to increases in attentional behavior. Also, the cue (tone) to record is a necessary element in the procedure, but the student can continue to record in its absence. Third, the recording response is a necessary element in the procedure, but the student can be weaned from reliance on it. Fourth, the self-monitoring procedure has been used with a high degree of success with no reliance upon backup reinforcers. Fifth, attentional behavior has been shown to maintain high levels after self-monitoring has been withdrawn. Finally, although the results are not as dramatic as for the dependent variable of attention, self-monitoring of attention during academic work leads to increases in academic productivity.

Although self-monitoring of attention may lead to increases in academic production, research has indicated that increased time on-task does not necessarily improve academic performance (Klein, 1979). Some researchers have argued that making an active academic response is more crucial to learning than attending to the task alone (Baer & Bushell, 1981; Graden, Thurlow, & Yssledyke, 1983).
Rooney, Polloway, & Hallahan (1985), examined the effects of using self-monitoring with low-IQ LD students with a direct focus on academic achievement. Students were taught two self-monitoring procedures. One procedure required that each time the pupils heard a audio cue from a tape recorder they stop and ask themselves whether they were paying attention and then record their "yes" of "no" answer on a prepared sheet. The second procedure required that each time the students completed a specific problem on their worksheets, they compared their answer for the problem to a prerecorded answer on an master sheet and mark whether they had responded correctly.

Results indicated that a combination of self-monitoring of attention and self-monitoring of math accuracy produced the greatest gains in both percent on-task and percent of problems completed correctly. For two of four students, analysis revealed a significant relationship between number of problems correct and percent on task. No relationship was reported between percent correct and percent on-task. For the other two students combined treatment improved on-task behavior.

The differential effects of self-monitoring of attentional behavior and self-monitoring of productivity on on-task behavior and academic response rate were investigated by Harris (1986). The subjects in this study were four learning
disabled students (ages 9 years 10 months to 10 years 6 months) enrolled in a self-contained classroom in a suburban elementary school. The subjects were nominated by their classroom teacher because they exhibited significant attentional and productivity problems. During the first intervention, students recorded the occurrence or nonoccurrence of their on-task behavior. The students followed self-monitoring procedures set up by Hallahan, Lloyd, Kauffman, and Loper (1983), that is, they were instructed to ask the question "Was I paying attention?" each time they heard a randomly emitted audio cue (average interval, 45s; range 10-90s). The students were then instructed to place a check in the "yes" or "no" column after each tone on their recording sheet. During the second intervention, students were instructed to count the number of times their spelling words had been written at the end of the period, and then record this number on a graph in their spelling folder. The order of the interventions were reversed for the last two subjects. When data collection was completed under both self-monitoring conditions, each subject chose one of the two procedures with which to continue.

Results indicated a increase in on-task behavior over baseline conditions during both self-monitoring of attention and self-monitoring of academic productivity. Results were less clear for academic response rate. Subject 1's performance was
equivalent under the two conditions, whereas Subject 2's productivity level was higher during self-monitoring of academic production. Subject 3 and 4's mean level of productivity was higher during self-monitoring of academic production, however both showed decreasing trends over the two conditions. Interviews with the subjects indicated a high degree of social validity for both self-monitoring procedures, although subjects stated that their first choice was self-monitoring of productivity.

In a study following Harris (1986), Lloyd, Bateman, Landrum, & Hallahan (1989) investigated the relative effects of self-monitoring of attentive behavior and self-monitoring of academic productivity. There were 5 students in an elementary special education classroom identified as seriously emotionally disturbed, learning disabled, or both that participated in this study. They were nominated by their teacher because they did not complete assignments and looked around the room during independent work periods. During the self-recording phase, students were required to record their own productivity or attention to task following an alternating treatment design.

The procedures for self-recording of attention to task closely followed those used by Hallahan et al., (1979). The students were to ask themselves whenever a tape-recorded cue occurred, whether or not they were paying attention to their
assignments and record their judgment on a prepared worksheet. The procedure for self-recording of productivity closely paralleled the procedure for attention-monitoring. However, instead of asking themselves whether or not they were attending at the time of the cue, the students were taught to ask themselves how much work they had completed. To make this judgment, they marked the problem on which they were working at the audio cue, counted how many problems they had completed since the previous cue, and recorded this number on prepared recording sheets. Following the multielement phase students were given a choice as to which procedure they wanted to continue to use. The self-recording procedure was faded by withdrawing the audio cue, and then three days later, the recording form.

Results indicated that clear changes in productivity occurred for each student when the self-monitoring procedures were introduced. Neither procedure produced superior levels of performance across all students, however there was a trend toward better performance under self-monitoring of attention. When given a choice, all students selected to self-monitor their attention to task, and performance remained at high levels. As the procedure was withdrawn, performance levels remained high even during maintenance probes.
The findings of the comparison of attention and productivity monitoring are not clear. Although the data from the Lloyd et al. (1989) study indicated that the two treatments were not equally effective, the differences were not consistent enough to favor one intervention over the other. Similarly, neither Rooney et al. (1985) nor Harris (1986) reported differences between the two procedures.

In a study investigating the effects of self-monitoring alone, and in combination with external contingent reward, Lalli et al. (1990) obtained results that showed contingent reward did not enhance the reactivity of self-monitoring for the majority of the students on sight word acquisition with two groups of learning disabled students. Sight word acquisition occurred for seven of the eight students equally under self-monitoring alone and self-monitoring plus reward phases. The addition of external contingent reward significantly increased the rate of acquisition for only one of the students. These findings support other research that has found self-monitoring alone to be reactive (Hallahan et al., 1979).

**GENERALITY OF BEHAVIOR CHANGE.**

Stokes and Baer (1977) define generality as "... the occurrence of relevant behavior under different nontraining conditions (i.e., across subjects, settings, people, behaviors, and/or time) without the scheduling of the same events in those
conditions. Thus generalization may be claimed when no extra training manipulations are needed for extra training changes; or may be claimed when some extra manipulation are necessary, but their cost is clearly less than that of the direct intervention" (p. 350).

Self-control training has been mentioned as a strategy for promoting generalization of behavior changes (Rosenbaum & Drabman, 1979). In their review of self-control training in the classroom, they listed four different classes of generalization: (a) time generalization refers to changes in the target behavior after the program contingencies have been withdrawn, (b) setting generalization occurs when changes in the target subjects' target behaviors obtained during an investigation transfer to a different environment, with program contingencies still in effect only in the therapeutic setting, (c) setting time generalization involves changes in the target subjects' target behaviors transfer to a different setting, when program contingencies are no longer in effect in the therapeutic setting, and (d) response generalization refers to changes in non-target behaviors of target subjects in the therapeutic setting during intervention.

Baer and Fowler (1984) also contend that self-control techniques hold promise for mediating generalization of behavior change across time. If self-management techniques
are taught to students to control their own behavior, and then those techniques are carried over to a variety of settings with a variety of behaviors and remain durable over time, generalization can be claimed.

Johnston (1979) referred to stimulus generalization and response generalization as two weapons in our training arsenal that can be used to extend training to other responses and circumstances. When we use procedures other than stimulus generalization and response generalization to transfer training to other settings, responses, or persons, we would use the term "generality" because generality often involves multiple behavioral principles and processes. For instance, generality may involve the response class that was originally selected for modification, contingencies of reinforcement which were arranged, or contingencies for the response class which exists in other settings (Johnston, 1979).

Two examples of generality will be examined: stimulus generality and response generality.

**Stimulus Generality**

Stimulus generality refers to a target behavior being emitted in the presence of an identified stimulus (Cooper, et. al., 1987). Students who exhibit a trained behavior in a setting different than the one where the training took place would be demonstrating stimulus generality. Walker and Buckley (1972)
achieved stimulus generality to the regular classroom by using the same academic materials in the remedial classroom as were used in the regular class.

Stimulus control techniques have been found to foster generality with preschool children. Guevremont, Osnes, and Stokes (1986) taught children verbalizations about preschool behaviors at school and then at home to study generalization effects. Generalization to home behaviors was obtained in the absence of prominent externally imposed contingencies after the children had reliably come under the control of verbalizations about preschool behaviors.

Drabman, Spitalnik, and O'Leary (1973) designed a study to teach self-evaluative behavior to disruptive third grade boys, and determine whether teaching self-evaluative behavior during a token program would lead to generalized behavior changes in social and academic behavior during a time of the day when the token program was not in effect. They also designed a program which would emphasize honest and truthful self-evaluation skills so that teachers could transfer full evaluative responsibility to the students in a manner that would produce long-range maintenance of appropriate behavior.

Eight 9- to 10-year old boys participated in an after-school token reinforcement program. There were three phases in this study (a) a teacher-administered token program in which
the students were allowed to earn bonus points for assignment completion and good behavior, (b) a matching phase, in which the students rated themselves on assignment completion and good behavior and matched their ratings with that of the teacher and were awarded additional bonus points if they were accurate, and (c) a fading phase in which children were selected randomly for matching their ratings with the teacher.

Overall, Drabman et al. (1973) found that after being taught to self-evaluate, disruptive children became significantly less disruptive than before they were taught to evaluate their own behavior. They also discovered that decreases in frequency of disruptive behavior occurred in a classroom where subjects were not trained to self-monitor, nor were they given external rewards.

Generalization and maintenance of appropriate behavior through self-control techniques was examined by Turkewitz, O'Leary and Ironsmith (1975). Through a systematic replication and extension of the Drabman et al., (1973) study they discovered that the positive gains made when disruptive junior high and high school students self-evaluated did not generalize when the students returned to the regular classroom. Observations of the students in the public school showed that there was no difference in the degree of behavior change between experimental and control students. The authors
explained that no attempt was made to prompt the students to self-evaluate in their home classes, and perhaps prompting and social reinforcement may be necessary to produce generalized outcomes.

Response Generality

Response generality refers to the extent to which the learner performs a variety of responses in addition to the trained response (Cooper et al., 1987). The term response generality is used to denote an increased likelihood that a given stimulus, previously paired with reinforcement for a particular response, will evoke a similar, but different response. Students who exhibit similar training effects on untrained behaviors would be demonstrating response generality. For instance, in a classic study Guess, Sailor, Rutherford, and Baer (1968) trained a female with mental retardation to name objects in the singular and plural. This generalized to her giving the correct plural forms for objects when only the singular form was taught.

Stevenson and Fantuzzo (1986) reported the generality effects of a self-control strategy with 3 underachieving fifth grade students to increase their arithmetic proficiency. During baseline, data were collected on the number of arithmetic problems completed accurately. A self-scorecard was implemented that contained spaces for date, name, target
behavior, goal options, reinforcer menu, daily score and goal completion rating. Students were trained by a coach of the same sex and race to complete the cards. The self-control procedures resulted in an increase in academic performance. Generality of skills occurred in the classroom. All of the teachers of the treated students indicated that the treatment procedures were helpful, appropriate for classroom use and easy to implement.

Goetz and Baer (1973) found that preschoolers who received descriptive reinforcement for form diversity in blockbuilding within a particular session displayed an emergence of new forms across other sessions as well. According to the researchers there was a possibility that the students were providing themselves with self-instruction to generalize the newly acquired blockbuilding skills to additional settings and forms.

Maintenance

Maintenance is the extent to which the learner continues to perform the target behavior after a portion or all of the intervention has been terminated. A lack of maintenance occurs when a desired behavior change that begins to be emitted in the nontraining setting meets extinction or punishment contingencies (Cooper et al., 1987).
In the literature on self-monitoring of attentional and academic productivity behavior very few studies have focused on the long-term effects of self-monitoring. McLaughlin (1983) examined the immediate and long term effects for on-task responding. Data were taken on both on-task and accuracy of performance in handwriting, spelling, and math with three behaviorally disordered elementary school students. The effects of the self-monitoring procedure were evaluated using a multiple-baseline design across subject-matter areas. The results revealed an increase in both on-task and academic performance when the students self-monitored their own on-task behavior. Only one student decreased his academic performance over that noted in baseline. Follow-up data were taken during the students first, second and third school years following the study. The results of the follow-up data yielded rates of on-task behavior over that of baseline, but not at the levels found in the self-monitoring condition. Even though the students were no longer required to self-monitor during the follow-up probes, some of the gains were maintained. One of the possible reasons for this was that informal observations revealed that some of the students continued to self-monitor their behavior after intervention was discontinued. Also, more positive teacher and peer group interactions took place after self-monitoring was introduced.
SOCIAL VALIDITY

When evaluating a study one of the most important questions a researcher can ask is: To what extent does this study have social validity? "Behavior analysis efforts that are effective in changing an individual's life in a socially important way are said to have social validity" (Cooper et al., 1987, p. 56). A researcher must question whether his or her treatment makes a difference, and if it does make a difference, is the behavior change functional. In other words, does the change in behavior produce reinforcement in the subject's natural environment.

Hawkins suggests that the potential meaningfulness of any behavior change should be judged within the context of habilitation, which he defines as "the degree to which the person's repertoire maximizes short and long-term reinforcers for that individual and for others, and minimizes short and long-term punishers" (1984, p. 284).

Wolf (1978) suggested that work aimed to do something of social importance be validated on at least three criteria: the social significance of the goals, the social appropriateness of the procedures, and the social importance of the effects.

The social significance of the goals. Are the specific behavioral goals really what society wants? Will an increase or decrease in the chosen target behavior result in an improvement in the subject's life either directly or indirectly. Van Houten
(1979) suggests that individuals who are widely acknowledged and accepted for their competence at a given behavior should be identified, and then, the standards and goals should be based on the performance of individuals who have not received any treatment.

The social appropriateness of the procedures. Do the ends justify the means? That is, do all subjects including the researcher, and care giver consider the treatment procedures acceptable? The independent variable of any study should be evaluated not only in terms of its effects, but also in terms of its complexity in applying the cost of implementation in terms of money and time. Most importantly the procedures should be socially acceptable. One measure of consumer satisfaction that is most commonly reported with treatment procedures is self-report, either to formal or informal questions regarding the procedures (Kazdin, 1980). The evaluation of the acceptability of treatment is normally based on the ratings of consumers who have had experience with the procedure.

The social importance of the effects. Are consumers satisfied with all of the results? Even though a behavior change is shown to produce a functional relationship on a graphic display, it may not represent a socially valid change in the target behavior for either the subject or significant others in the subject's natural environment.
Social validation of effects is a method that has been used for assessing the clinical significance of a treatment effect, and relies on two procedures: social comparison and subjective evaluation (Kazdin, 1977).

Social comparison requires the identification of peers who differ from the subject only with respect to the presence of the target behavior. The changes that bring the subject's behavior within range of the their peers' behavior is normally judged to be clinically significant. Subjective evaluation requires clients, experts, or consumers of services to assess the social importance of treatment effects subjectively. Subjective judgments are appropriate for evaluating the clinical or social impact of a behavior change.

Behavior analysts use social validation procedures to select target behaviors and to evaluate the changes as being socially significant. Van Houten (1979) proposed using the social validation process to determine the optimal levels for target behaviors. Two ways for determining socially validated goals are through the performance of highly competent individuals in the field, and through empirical assessment. The optimal range of performance can be selected by experimentally manipulating different levels of performance, or by evaluating the effects of training to various standards on the subsequent acquisition of more complex skills. There are few
experimentally, validated treatment objectives and the focus of those that are available is on the optimal level of an identified target behavior, rather than on the identification of the target behavior itself.

Bailey and Lesson (1984) suggest that the primary consideration in applied research is the need for a change in the target behavior. They recommend that all researchers should justify the planned treatment for the individual, and present data that show the norm for the behavior of concern and the degree of modification needed to bring the behavior into a competitive range. Bailey and Lessen also suggest that researchers select the most effective technique to change the behavior as shown through current literature or direct observation, and demonstrate that the skill also takes place in the natural setting. Finally, researchers should be able to identify the entire range of skills required, for independent functioning in a particular situation; and publish only educational research designed to advance subject independence.
CHAPTER III

METHOD

This section describes the subjects, settings, procedures, and the experimental design used in the study. The dependent variables are defined and their measurements is discussed. Also included is a list and description of the materials that were used in this study.

Subjects

Five seventh grade students who were classified as learning disabled served as subjects for this study. The students were classified as learning disabled based on a discrepancy between their achievement and intelligence quotient, and consistent with standards for placement in the state of Ohio. Further, the subjects in this study were nominated and selected by their SLD teacher because they received poor grades in the regular classroom, and exhibited a lack of attentional behavior. From a total population of 7 students, the teacher nominated 5 students for the study. The students range in age from 13-15. The teacher believed that the students needed additional help with academic productivity and behavior, and they would be the best candidates.
The subjects attended a special class for the learning disabled, and were mainstreamed into several regular education classes. Table 1 shows the distinguishing characteristics of the sample population. In addition to the demographic data provided in Table 1, the SLD teacher provided the following narrative description of the students.

**Student 1.** During his elementary grades, Student 1 was placed in a classroom for students with communicative disorders. During the time of the study he received SLD services and speech therapy. According to his teacher, he was normally quiet, but got along well with the other students and he could work cooperatively in groups, after receiving extra help to get started. Also, he played on the basketball team.

**Student 2.** Student 2 had difficulty staying "on-task". He would get frustrated easily, and noisy environments seemed to add to his frustration. He usually could not find his papers (i.e., in his notebook, pockets, jacket, or locker), and he liked to visit with other students during instructional time. He started his assignments, but did not always finish them or remember what he had to get finished. When he did work on an assignment, he would use one concept or method, and had a difficult time switching to a different methodology. He was likable, although immature, and at lunch had a permanent seat assigned to him away from his friends.
Table 1

Subject Matrix Showing Distinguishing Characteristics of the Sample Population

<table>
<thead>
<tr>
<th>Subject Position</th>
<th>Gender</th>
<th>Age</th>
<th>Ethnicity</th>
<th>Math</th>
<th>Reading</th>
<th>Comp.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>M</td>
<td>14</td>
<td>CAUCASIAN</td>
<td>3</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>M</td>
<td>13</td>
<td>CAUCASIAN</td>
<td>2</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>3</td>
<td>M</td>
<td>15</td>
<td>BLACK</td>
<td>2</td>
<td>4</td>
<td>3.5</td>
</tr>
<tr>
<td>4</td>
<td>F</td>
<td>13</td>
<td>CAUCASIAN</td>
<td>3</td>
<td>3</td>
<td>4.5</td>
</tr>
<tr>
<td>5</td>
<td>M</td>
<td>13</td>
<td>CAUCASIAN</td>
<td>3</td>
<td>4</td>
<td>3.5</td>
</tr>
</tbody>
</table>
Student 3. Student 3 had difficulty staying "on-task". The work he completed was usually accurate, but he often had late or incomplete assignments, and his grades suffered as a result. He liked to joke, but sometimes his comments came off as being rude or inconsiderate. He was a starter on the football team. The teachers hoped to use football as an incentive to improve his grades during the second semester, since he was not on any other school teams. However playing football did not improve his grades; he received two F's on his first quarter grades.

Student 4. Student 4 was a continual talker, and she was easily distracted by other students. Too much noise seemed to frustrate her. She did her work quickly, and many times misspelled her name and could not tell what was wrong with it. She was easily swayed by the behavior of her peers. She was very disorganized with her locker and materials, and she misplaced her assignments causing incompletes on assigned homework. She had a good attitude and was involved in music and volleyball.

Student 5. Student 5 had a difficult time staying on task. He bothered his neighbors by talking and bantering with them. He was sometimes rude and inconsiderate to teachers and students. Prior to the study, he had missed allot of school and was frequently tardy. He was also suspended from school often. On several occasions he had refused to do classroom
assignments, and rarely completed homework assignments independently.

**Setting**

The subjects in this study attended a suburban public middle school which had an enrollment of 503 students. Specifically, this study took place in two different special education classrooms for students with learning disabilities. The first daily session was conducted in the special education classroom during the sixth period of the day (12:45 pm-1:55 pm). During this period, there was a total of 7 learning disabled students enrolled in a study review skills class. The general procedures were then replicated with the same subjects during the eighth period of the day (2:15 pm-2:25 pm) in a math special education classroom. The eighth period classroom had a total of 10 students with learning disabilities, including the five students who served as the subjects in the study.

**Teachers**

There were two teachers providing instruction during the course of this study. Both teachers were certified special education teachers. The first teacher had been in the classroom for 9 years as a learning disabilities teacher and regular education teacher, 3 years of which were in the middle school SLD setting. Also she had certification in elementary education (1-8), special education (SLD/SBH), and reading (k-12). She
also held a Master of Arts in reading, and was working on supervision certification.

The other teacher had a Bachelor of Science in special education with a minor in physical education. He taught school for 2 years, both of which were in special education. During the time of the study, he was teaching seventh and eighth grade students with learning disabilities math and history.

**Experimenter**

The experimenter was a third year doctoral candidate majoring in special education with an emphasis in applied behavior analysis at The Ohio State University. The experimenter had a total of six years experience as a special education teacher and consultant, including one year as a elementary resource room teacher for students with mental retardation, learning disabilities, visual impairments, and emotional disturbance. Also she had three years of experience with autistic and trainable mentally retarded students. In addition, the experimenter had two years experience as a educational consultant for regular and special education teachers, grade levels kindergarten through twelve.

**Definition and Measurement of Dependent Variables**

Six dependent variables were measured in this study. These variables were: (a) rate of academic production (b) percent of on-task behavior, (c) accuracy of student self-
monitoring, (d) teacher-student interactions, and (e) students' and teachers' opinions of the effectiveness of self-monitoring.

**Academic production.** Academic production was defined as the students' rate of performance on (a) prepared worksheets in the study skills SLD classroom (see Appendix A), and (b) prepared worksheets in the mathematics SLD classroom (see Appendix B).

The unit of measurement for productivity was rate as defined by student movement. A movement was considered to be a letter, numeral, or mark written in the answer space to a question or problem. This unit was used because it provided a consistent measure of performance across problems of differing levels of difficulty. Rate was equal to the number of responses (movements) divided by time, yielding an index of rate per minute. Time remained constant during the study (10 minutes).

Experimental data were obtained by having the experimenter count the number of problems completed at a later time, to find out how accurate the students were in their self-monitoring of productivity. The audio cue "record" occurred on a random schedule for the 10 minute session, intervals ranged from 30 seconds to 90 seconds for a total of 10 intervals.

**On-task behavior.** On-task behavior was defined as the student being engaged actively in looking at his or her assigned study skills or mathematics work and holding his or her pencil
in a writing or erasing position. Data on student on-task behavior were linked to student performance on mathematics and study skills assignments only.

Data were collected using a 5-second whole interval time sampling procedure. In other words, the student had to be on-task for the entire duration of the interval to be recorded as on-task. If the student was off-task for any portion of that 5-second period his or her behavior was recorded accordingly. Each student was recorded twice during a 50-segment interval. Each day the observer began the recording process with a different student, using a schedule that was randomly determined. The observer was trained to use the recording instrument with a audio cue of "record". The observer used a tape recorder that had a Y-Jack attached so that both the observer and experimenter experienced the same audio recording. The audio tape cued the recorders with the words "Ready, begin" followed with the word "1", followed by a 5-second pause (observers sampled and recorded a students on-task behavior and teacher-student interaction) and the word "2" followed by a 5-second pause (observers sampled and recorded another student's behavior and teacher-student interaction), the observer and experimenter recorded on the master sheet, and the procedure started over with student 3, and so on, until all students had been monitored. At the 50-second mark, a cue
announced "rest", at which time the recorders rested. At the 58-second mark the cue heard was "Ready to begin" followed with the word "11" (which stands for the 11th interval) followed by a 5-second pause (observers sampled and recorded the same students' behavior which was recorded at the word "1"). This sequence continued throughout the entire 10-minute session in which the last interval recorded was number "100". This allowed for each student to be observed on 20 different occasions for each session. Observers recorded student behavior and teacher-student interaction behavior for each interval.

Students were judged to be on-task when they were engaged actively in looking at their assignments, and holding their pencils in a writing or erasing position. Off-task was recorded when the students held other objects, used their hands in some other activity, or were looking around the classroom.

The experimenter monitored the five subjects on-task behavior on a master sheet (see Appendix D). Data were collected during the first 10 minutes of each 40-minute period. This arrangement allowed time for preparing recording sheets and gathering materials before the beginning of the period, providing feedback during training, cleaning up, and totaling responses at the end of the session.
The subjects' percentage of intervals on-task, was calculated using the experimenter-recorded data and counting the number of intervals on-task, dividing that number by the total intervals observed, and multiplying by 100.

Accuracy of student self-monitoring. Student self-monitoring was assessed by comparing the student's academic production recording forms with the experimenter's on a daily basis for each session. The total number of items completed was assessed using the worksheets as permanent products and the students total number of items recorded for each session was compared with the total number of items the observer recorded.

Teacher-student interactions. Teacher-student interactions were defined as (a) positive interaction (e. g., teacher performs actions such as making positive comments, providing, redirective statements or constructive feedback, placing a hand on student's shoulder etc.), (b) negative interaction (e. g., teacher admonishes, or chastises student), or (c) no/neutral interaction (e. g., no interaction, or interaction not based on instructional activity). Teacher interaction was assessed on an individual and group basis.

Teacher-student interaction (positive, negative, or no/neutral) on an individual basis was recorded during the same interval for each student as on-task behavior. Teacher-student
interaction on a group basis was assessed during any one particular student's recording interval.

Students' and teachers' opinions. Students' and teachers' opinions were obtained using student and teacher responses on an exit interview administered following the last phase of the study (see Appendix E). These surveys were administered by an independent observer, and served as a measure of social validity. Procedurally, the observer read aloud each statement on the exit interview and gave students time to respond in writing. The forms for the teachers were also administered following the conclusion of the study by the independent observer. The results of the exit interviews were compiled and reported by the experimenter. A daily log of student and teacher comments on the use of self-monitoring was kept and relevant comments reported.

Interobserver Agreement Measures

An interobserver agreement check of the self-monitoring program was conducted for 23 percent of the total sessions. Also 25 percent of the permanent products produced by the students had an interobserver agreement check. The observer was trained in the recording process. The observer was a doctoral student majoring in special education with an emphasis in applied behavior analysis at The Ohio State University. Observer training took place for 60 minutes in a
separate classroom. Training was completed when observers reach 85% agreement for three consecutive training simulations.

Permanent products were assessed by comparing the total number of movements counted by the experimenter to the total number counted by the observer and expressed as a percentage. Agreement measures were also calculated between the observer and student with respect to the number and rate of problems completed per session.

Training the observer to record on-task behavior entailed practice at recognizing on-task behaviors and off-task behaviors (e.g., staring out the window, talking to a neighbor, not holding writing utensil). Training also consisted of the observer learning how to recognize and record positive teacher-student interactions (e.g., teacher providing praise or positive comments to student, teacher providing constructive feedback, touching a student's shoulder). The observer was trained to recognize negative teacher-student interaction (e.g., teacher admonishing or chastising a student). Also, the observer learned to recognize teacher-student neutral interaction (e.g., no interaction, or interaction not based on the instructional assignment).

The formula used to establish the percentage of interobserver agreement for on-task behavior was calculated
using the interval-by-interval method (number of interval agreements divided by total number of agreements and disagreements multiplied by 100).

\[
\frac{\text{agreements}}{\text{agreements + disagreements}} \times 100
\]

Procedural reliability was obtained by having the interobserver complete a checklist format on a random basis in the training session and during self-monitoring sessions (see Appendix F). This was done to ensure that the procedures were implemented as intended.

**Materials**

**Student recording sheet.** The student recording sheet contained spaces for name, date, class, and intervention number. Each sheet also contained 10 boxes for students to record their academic production and spaces for their rate per minute total (See Appendix C).

**Master recording sheet.** The master recording sheet consisted of a single sheet with spaces for the date, intervention number, class, and percentage, plus codes for recording each of the students' behavior and teacher-student interactions. The master sheet listed the on-task behaviors and the categories for teacher-student interactions. This master sheet was also used by outside observer (See Appendix D).
Exit interview forms. A form for the students' and teachers' opinions was duplicated by the experimenter and distributed to the students and teachers by an independent observer at the end of the study (See Appendix E).

Procedural reliability check lists. Two checklists were used by outside observers to ensure that procedures were implemented as intended. One was used for training and one for self-monitoring sessions (See Appendix F).

Parental consent form. A consent form signed by a parent or guardian was for each student who took part in the study (See Appendix G).

Training script. A training script was used for training students the recording process to ensure that all subjects received the same training (See Appendix H).

Pre-recorded audio-tapes. Two pre-recorded audio tapes were used one for the experimenter and observer and one for the students. The audio tape for the students contained a variable interval cue of "record" and the range was 30 seconds to 90 seconds in length. The prerecorded audio-tapes were precalibrated and verified by an independent observer who did not know the actual times when the cue was emitted.

Cassette recorders. Two cassette recorders were used to play the pre-recorded audio tape, so that students, experimenter, and observers could hear the verbal cue "record".
Experimental Design

A multiple baseline design across subjects was used in both settings. The multiple baseline design was introduced by Baer, Wolf, and Risley (1968). It has become one of the most widely used designs in applied behavior analysis because it allows the researcher to analyze the effects of an independent variable across multiple behaviors, settings, and/or subjects without having to withdraw the treatment variable.

In this study simultaneous baseline measurement was obtained on the academic production and on-task behavior of the five subjects. Once a stable baseline was achieved, the independent variable was applied to the subject showing the most stable baseline while baseline conditions remained in effect for the other students. After maximum change (20% above baseline mean) was noted in the first subject's behavior, the independent variable was then applied in sequential fashion to the other student's behavior (two at a time) in the design. Experimental control was demonstrated when the student's behavior changed when, and only when, the independent variable was applied.

The experimenter made the prediction that without the intervention, the students' on-task behavior would remain at baseline levels. Baseline 1 for student 1 served as the prediction condition. Verification was noted by observing the
baseline performance of the other four students' after the first had been treated. Replication was demonstrated after self-monitoring was introduced successively to new students and the academic production and on-task behavior improved.

**General Procedures**

Academic production and on-task data were collected in both the SLD classrooms. The study ran for 47 school days ending in June, 1990. Classroom teachers were responsible for passing out the appropriate worksheets and instructing the students to complete as many of the problems as they could and also for telling the students to stop when the 10-minute session was over. The experimenter was responsible for all materials preparation.

**Baseline.** The experimenter collected at least 10 days of baseline data on each student before training and implementing the intervention with the first student. The presence or absence of the dependent variable on-task behavior was noted at 5-second intervals throughout the entire study for each initial student involved. To change interventions, students were required to maintain a minimum on-task percentage of 20% above the baseline mean, for three consecutive days. If performance was below 20% of the baseline mean the experimenter would have introduced a feedback chart that showed the students how they were doing on a daily basis.
During baseline, the classroom teachers distributed the appropriate worksheet and the experimenter recorded students' attentional behavior twice during each 1-minute interval. Teachers instructed the students to do the worksheets. Target students were not required to record. Baseline continued for 11-18 sessions. After training occurred for the students in study skills, the students were prompted to take recording forms with them to the math setting.

Permanent products were taken at the end of each session to compare student academic production during intervention with baseline conditions. During baseline, students were not told that their on-task behavior was being recorded, and if the teacher was asked by students why the experimenter was in the room, the teacher said that the experimenter was observing to determine the kinds of instructional strategies being used and how they may be improved.

**Training: Self-monitoring Intervention.** Training was conducted by the experimenter on an individual basis with each subject. Training took place in an unoccupied classroom for 20 minutes over 2 sessions prior to the first session of the day. A training script was used to ensure that all subjects received the same training. Training began with each student when the experimenter showed the students a graph of their previous performance.
Students were trained to assess and record their rate of academic production. Students were given a chance to practice with the audio cue "record" and was provided with feedback as to accuracy of their recording.

The students were instructed that the experimenter was recording their on and off task behaviors and they were told what was defined as being on-task or off-task. After each training session the students were checked for accuracy of their total rate of academic production and were rewarded with verbal praise for high accuracy or encouraged to record accurately whichever was appropriate.

Self-Monitoring - Audio Cue. During self-monitoring in study skills, students were required to assess and record their academic production behavior at the audio cue "record" by marking their worksheet with a slash at the sound "record" and counting backwards the number of items completed to the previous slash or beginning of worksheet. Students marked that number in the appropriate box on the student recording sheet. The audio cue "record" occurred on a random schedule for the 10-minute session. Intervals ranged from 30 seconds to 90 seconds for a total of 10 intervals. After students had consistently recorded their academic production in the math
setting without the audio cue of "record" the cue was removed from the study skills setting and the students continued to self-monitor their academic production in the absence of the audio cue. Maintenance checks followed the self-monitoring phase. The last two maintenance probes were done without the students using the self-recording form and in the absence of the audible cue.

The exact length of the experimental phase depended upon the performance of the students, that is, to maintain a minimum of 20% above the baseline mean for three consecutive days.

During this phase, students were checked randomly for accuracy of rate of academic production once a week. They received social praise for high accuracy or encouraged to record accurately whichever was appropriate.

**Self-Monitoring - No Audio Cue.** During self-monitoring - no audio cue the students continued to self-monitor their academic production as they did in the previous phase with the exception of the audio cue. There was no training involved since they had consistently recorded their academic production rate in the math setting without the audio cue. Students continued to be checked randomly for accuracy of the self-monitoring procedure.
Maintenance. During maintenance, the procedures remained the same as the self-monitoring - no audio cue phase for the first maintenance check. During the remaining maintenance checks neither the audio cue or the self-monitoring forms were used by the students to record academic production.
CHAPTER IV

RESULTS

This chapter presents the results of the study. First interobserver agreement results are described. Then, results of self-monitoring on the academic production and on-task behavior are presented for both the regular setting and the generality setting, followed by accuracy of student self-monitoring. Next, teacher-student interactions are summarized. Finally, the responses from the questionnaires administered to the students and teachers on the social validity of the independent variable are addressed.

INTEROBSERVER AGREEMENT

Dependent Variables

Academic production. Interobserver agreement checks for 25% of the permanent products produced by the students in the regular and generality setting were recorded by an independent observer. Permanent products were assessed by comparing the total number of movements counted by the experimenter with the total number counted by the independent observer. Data are expressed as a percentage. Table 2 shows the mean percentage
Table 2

Mean Percentage and Range of Permanent Product Interobserver Agreement Measures for Each Subject in the Study skills (Regular) Classroom and the Math (generality setting) Classroom

<table>
<thead>
<tr>
<th>Student</th>
<th>Study Skills</th>
<th>Math</th>
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<tbody>
<tr>
<td></td>
<td>Mean</td>
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<td>3</td>
<td>98.7</td>
<td>87.9-100</td>
</tr>
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<td>97.1-100</td>
</tr>
<tr>
<td>5</td>
<td>99.2</td>
<td>98.2-100</td>
</tr>
<tr>
<td>Group</td>
<td>99.1</td>
<td>87.9-100</td>
</tr>
</tbody>
</table>
and range for each subject in both settings. The group mean for total interobserver agreement on permanent products across students was 99.1% in the study skills classroom, range 87.9-100%. In the math classroom, the interobserver agreement on permanent products group mean was 99%, range 95.8%-100%.

**On-Task behavior.** Interobserver agreement checks for 21% of the total sessions in both the study skills and the math setting were recorded by an independent observer in which student on-task behavior was the focus. The formula used to establish percentage of on-task behavior was calculated using the interval-by-interval method (number of interval agreements divided by total number of agreements and disagreements multiplied by 100). Table 3 shows the percentage of interobserver agreement across students for each session in which an interobserver agreement check was calculated. The group mean for total interobserver agreement for on-task behavior was 97% in study skills, range 92-100%. The group mean in math was 97.4%, range 94-100%.

**Independent Variable**

Interobserver agreement was conducted on the independent variable by a trained observer. The purpose of the interobserver agreement on the independent variable was to ensure that the experimental procedure was implemented as intended. Using independent variability measures (two
Table 3

Percentage of Interobserver Agreement on On-Task behavior in the Study skills (regular) setting and the Math (generality) setting for each session in which an interobserver agreement check was calculated.

<table>
<thead>
<tr>
<th>Session</th>
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<th>Math</th>
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</thead>
<tbody>
<tr>
<td>1</td>
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<td>95</td>
</tr>
<tr>
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<td>95</td>
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</tr>
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<td>99</td>
</tr>
<tr>
<td>10</td>
<td>97</td>
<td>98</td>
</tr>
</tbody>
</table>

| Mean    | 97           | 97.4  |
| Range   | 92-100%      | 94-100%|

Total Interobserver Agreement across settings 97.2%
questionnaires, consisting of closed-ended questions) the independent observer viewed 21% of the intervention sessions and 40% of the training sessions. A copy of these questionnaires can be found in Appendix F. Results indicate that the independent variable was implemented as intended for 100% of the intervention sessions in which reliability was monitored. Results of the training sessions indicate that training procedures were implemented as intended for 100% of the sessions in which reliability was checked.

STUDENT SELF-MONITORING

Academic Production

Academic production was defined as the student's rate of performance on (a) prepared worksheets in the study skills SLD classroom, and (b) prepared worksheets in the mathematics SLD classroom. The unit of measurement was rate as defined by student movement. A movement was considered to be a letter, numeral, or mark written in the answer space to a question or problem. Figure 1 shows student 1-5's rate of production on the daily 10-minute prepared worksheet in the study skills and math classrooms.

Student 1. Student 1 was present in the study skills classroom for 41 of the study's 47 sessions. The mean rate of production for each condition in the study skills room during Baseline was 12.7 movements, range 5.1-26. During Training,
Figure 1. Student 1-5 rate of movement per minute on daily 10-minute prepared worksheets in study skills and math.

**Study Skills**

MOVEMENTS PER MINUTE

<table>
<thead>
<tr>
<th>STUDY SKILLS</th>
<th>MOVEMENTS PER MINUTE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline</td>
<td>S-M Audio Cue</td>
</tr>
<tr>
<td>S-M No Audio Cue</td>
<td>Maintenance</td>
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</tbody>
</table>

**Math**

MOVEMENTS PER MINUTE

<table>
<thead>
<tr>
<th>STUDY SKILLS</th>
<th>MOVEMENTS PER MINUTE</th>
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<tbody>
<tr>
<td>Baseline</td>
<td>S-M Audio Cue</td>
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<tr>
<td>S-M No Audio Cue</td>
<td>Maintenance</td>
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<td>Maintenance</td>
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the mean rate and range of movements that occurred was 8.7. During Self-monitoring Audio Cue, a mean of 45.3 movements occurred, range 35.1-68.5 During Self-monitoring No Audio Cue, 50.8 movements occurred, range 39.1-71.5. Finally, during Maintenance, an average of 48.5 movements occurred, range 40.5-56.2.

Figure 1 also shows student 1's rate of production on the daily 10-minute prepared worksheet in the math classroom (generality setting). Student 1 was present for 42 of the study's 47 sessions. The mean rate of production for student 1 in the math classroom during Baseline was 8.1 movements, range 2.5-15.8. During Self-monitoring No Audio Cue, 40.9 movements occurred, range of 21.8-48.1. Finally, during Maintenance, an average of 49 movements occurred, range 46.2-52.5.

**Student 2.** Figure 1 shows student 2's rate of production on the daily 10-minute prepared worksheet in the study skills and math classrooms. Student 2 was present in the study skills classroom for 44 of the study's 47 sessions. The mean rate of production for each condition in the study skills room during Baseline was 8. movements, range 0-22.6. During Training, the mean rate and range of movements that occurred was 3.9. During Self-monitoring Audio Cue, a mean of 36.1 movements occurred, range 29.6-57.2. During Self-monitoring No Audio
Cue, 40.7 movements occurred, range 33.7-63.7. Finally, during Maintenance, an average of 43.8 movements occurred, range 41.8-46.3.

Also shown in Figure 1 is student 2's rate of production on the daily 10-minute prepared worksheet in the math classroom (generality setting). Student 2 was present for 42 of the study's 47 sessions. The mean rate of production for student 2 in the math classroom during Baseline was 4.2 movements, range 0-12.1. During Self-monitoring No Audio Cue, 41.4 movements occurred, range of 17.9-58.5. Finally, during Maintenance, an average of 43.3 movements occurred, range 40.4-47.9.

**Student 3.** Figure 1 shows student 3's rate of production on the daily 10-minute prepared worksheet in the study skills and math classrooms. Student 3 was present in the study skills classroom for 47 of the study's 47 sessions. The mean rate of production for each condition in the study skills room during Baseline was 9.2 movements, range .7-25.5. During Training, the mean rate and range of movements that occurred was 1.6. During Self-monitoring Audio Cue, a mean of 53.8 movements occurred, range 34.4-64. During Self-monitoring No Audio Cue, 79.8 movements occurred, range 65.6-86.7. Finally, during Maintenance, an average of 78.5 movements occurred, range 75.4-84.5.
Figure 1 also shows student 3's rate of production on the daily 10-minute prepared worksheet in the math classroom (generality setting). Student 3 was present for 45 of the study's 47 sessions. The mean rate of production for student 3 in the math classroom during Baseline was 10.5 movements, range 3.8-27. During Self-monitoring No Audio Cue, 44.9 movements occurred, range of 26.3-62.8. Finally, during Maintenance, an average of 58.5 movements occurred, range 49.1-61.6.

Student 4. Figure 1 shows student 4's rate of production on the daily 10-minute prepared worksheet in the study skills and math classrooms. Student 4 was present in the study skills classroom for 41 of the study's 47 sessions. The mean rate of production for each condition in the study skills room during Baseline was 15.1 movements, range 3.5-30.3. During Training, the mean rate and range of movements that occurred was 6.9. During Self-monitoring Audio Cue, a mean of 58.7 movements occurred, range 47.1-76.8. During Self-monitoring No Audio Cue, 81.1 movements occurred, range 72.7-99.4. Finally, during Maintenance, an average of 83.5 movements occurred, range 77.9-94.1.

Also shown in Figure 1 is student 4's rate of production on the daily 10-minute prepared worksheet in the math classroom (generality setting). Student 3 was present for 41 of the
study's 47 sessions. The mean rate of production for student 4 in the math classroom during Baseline was 10.8 movements, range 2.9-18.2. During Self-monitoring No Audio Cue, 52.5 movements occurred, range of 30.3-86.7. Finally, during Maintenance, an average of 60. movements occurred, range 54.9-70.1.

**Student 5** Figure 1 shows student 5's rate of production on the daily 10-minute prepared worksheet in the study skills and math classrooms. Student 5 was present in the study skills classroom for 42 of the study's 47 sessions. The mean rate of production for each condition in the study skills room during Baseline was 5.96 movements, range 0-16.4. During Training, the mean rate and range of movements that occurred was 2.4. During Self-monitoring Audio Cue, a mean of 34.9 movements occurred, range19.9-52.3. During Self-monitoring No Audio Cue, 52.0 movements occurred, range 39.3-73.9. Finally, during Maintenance, an average of 48.2 movements occurred, range 45.5-49.7.

Figure 1 also shows student 5's rate of production on the daily 10-minute prepared worksheet in the math classroom (generality setting). Student 5 was present for 42 of the study's 47 sessions. The mean rate of production for student 5 in the math classroom during Baseline was 6.2 movements, range 0-16.1. During Self-monitoring No Audio Cue, 32.3
movements occurred, range of 24.4-62.8. Finally, during Maintenance, an average of 47.0 movements occurred, range 46.2-47.5. Figure 2 shows the average rate of movement per minute across all students during Baseline, Training, Self-monitoring (Audio Cue,), Self-monitoring (no Audio Cue,), in study skills was 9.9, 4.7, 45.7, and 60.9 respectively. In math, the average rate of movement per minute across all students during Baseline, Self-monitoring (no Audio Cue,), was 9.0 and 43.1 respectively.

Summary. The data indicate that academic productivity increased for each student in study skills and math when self-monitoring was introduced. Student productivity remained high in the absence of the audio cue, and remained high during maintenance even in the absence of self-recording forms. Self-monitoring produced the greatest effect on Student 3 and Student 4. Both students showed a substantial increase in their academic performance when self-monitoring was introduced and both students remained on an accelerated trend throughout the study.

On-Task Behavior

On-task behavior was defined as the student being actively engaged in looking at his or her assigned study skills or mathematics and holding his or her pencil in a writing or erasing position. Data on student on-task behavior were linked
Figure 2. Average group rate of movement per minute in study skills and math.
to student performance on mathematics and study skills assignments only. Figure 3 shows student 1-5's percentage of on-task behavior on the daily 10-minute prepared worksheet in the study skills classroom.

**Student 1.** Student 1 was present in the study skills classroom for 41 of the study's 47 sessions. The mean percentage of time on-task behavior for each condition in the study skills room during Baseline was 25%, range 15-45%. During Training, the mean percentage of time on task and range was 15%. During Self-monitoring Audio Cue, a mean of 93.3%, time on task, range 75-100%. During Self-monitoring No Audio Cue, the mean was 92%, range 75-100%. Finally, during Maintenance, Student 1 produced a mean of 98.3%, range 95-100%.

Figure 3 also shows student 1's percentage of on-task behavior on the daily 10-minute prepared worksheet in the math classroom (generality setting). Student 1 was present for 42 of the study's 47 sessions. The mean percentage of on-task behavior for student 1 in the math classroom during Baseline was 28.3%, range 15-40%. During Self-monitoring No Audio Cue, the mean was 92%, range 80-100%. Finally, during Maintenance, Student 1's mean was 98.3%, range 95-100%.

**Student 2.** Figure 3 shows student 2's percentage of on-task behavior on the daily 10-minute prepared worksheet in the
Figure 3. Student 1.5's percentage of on-task behavior on 
study skills and math.

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<thead>
<tr>
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</table>

Baseline | Self-Monitoring | No Audio Cue | Maintenance

Math |

Student 1

Student 2
Figure 3 continued

**STUDY SKILLS**

<table>
<thead>
<tr>
<th>Sessions</th>
<th>Student 3</th>
<th>Student 4</th>
</tr>
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<tbody>
<tr>
<td></td>
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</tr>
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**MATH**

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<tr>
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</tr>
</tbody>
</table>

**PERCENT ON-TASK**

- Baseline: 0%
- S-M Audio Cue: 100%
- S-M No Audio Cue: 80%
- Maintenance: 60%

**SESSIONS**

- Student 3: Sessions 1-50
- Student 4: Sessions 1-50
Figure 3 continued

STUDY SKILLS

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</tr>
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<tbody>
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</tr>
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PERCENT ON-TASK

<table>
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Baseline | S-M Audio Cue | S-M No Audio Cue | Maintenance

MATHEMATICS

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PERCENT ON-TASK

<table>
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</thead>
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<tr>
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<tr>
<td>80</td>
</tr>
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</table>

Baseline | S-M No Audio Cue | Maintenance

Student 5
study skills classroom. Student 2 was present in the study skills classroom for 44 of the study's 47 sessions. The mean percentage of time on-task behavior for each condition in the study skills room during Baseline was 16%, range 0-45%. During Training, the mean percentage of time on task and range was 5%. During Self-monitoring Audio Cue, a mean of 81.6%, time on task, range 70-100%. During Self-monitoring No Audio Cue, the mean was 90%, range 85-100%. Finally, during Maintenance, Student 2 produced a mean of 95%, range 90-100%.

Figure 3 also shows student 2's percentage of on-task behavior on the daily 10-minute prepared worksheet in the math classroom (generality setting). Student 2 was present for 42 of the study's 47 sessions. The mean percentage of on-task behavior for student 3 in the math classroom during Baseline was 15.6%, range 0-50%. During Self-monitoring No Audio Cue, the mean was 84.6%, range 85-100%. Finally, during Maintenance, Student 2's mean was 95%, range 90-100%.

Student 3. Figure 3 shows student 3's percentage of on-task behavior on the daily 10-minute prepared worksheet in the study skills classroom. Student 3 was present in the study skills classroom for 47 of the study's 47 sessions. The mean percentage of time on-task behavior for each condition in the study skills room during Baseline was 22.3%, range 10-50%. During Training, the mean percentage of time on task and range
was 10%. During Self-monitoring Audio Cue, a mean of 92.8%, time on task, range 85-100%. During Self-monitoring No Audio Cue, the mean was 94.5%, range 90-100%. Finally, during Maintenance, Student 3 produced a mean of 96.7%, range 95-100%.

Also shown in Figure 3 is student 3's percentage of on-task behavior on the daily 10-minute prepared worksheet in the math classroom (generality setting). Student 3 was present for 45 of the study's 47 sessions. The mean percentage of on-task behavior for student 3 in the math classroom during Baseline was 34%, range 15-60%. During Self-monitoring No Audio Cue, the mean was 96.3%, range 90-100%. Finally, during Maintenance, Student 3's mean was 96.6%, range 95-100%

**Student 4.** Figure 3 shows student 4's percentage of on-task behavior on the daily 10-minute prepared worksheet in the study skills classroom. Student 4 was present in the study skills classroom for 41 of the study's 47 sessions. The mean percentage of time on-task behavior for each condition in the study skills room during Baseline was 27.1%, range 5-55%. During Training, the mean percentage of time on task and range was 5%. During Self-monitoring Audio Cue, a mean of 92.3%, time on task, range 80-100%. During Self-monitoring No Audio
Cue, the mean was 96.3%, range 90-100%. Finally, during Maintenance, Student 4 produced a mean of 98.3%, range 95-100%.

Figure 3 also shows student 4's percentage of on-task behavior on the daily 10-minute prepared worksheet in the math classroom (generality setting). Student 4 was present for 41 of the study's 47 sessions. The mean percentage of on-task behavior for student 4 in the math classroom during Baseline was 28.5%, range 10-60%. During Self-monitoring No Audio Cue, the mean was 96.6%, range 85-100%. Finally, during Maintenance, Student 4's mean was 93.3%, range 85-100%.

Student 5. Figure 3 shows student 5's percentage of on-task behavior on the daily 10-minute prepared worksheet in the study skills classroom. Student 5 was present in the study skills classroom for 42 of the study's 47 sessions. The mean percentage of time on-task behavior for each condition in the study skills room during Baseline was 11.7%, range 0-45%. During Training, the mean percentage of time on task and range was 10%. During Self-monitoring Audio Cue, a mean of 89.0%, time on task, range 55-95%. During Self-monitoring No Audio Cue, the mean was 91.5%, range 85-100%. Finally, during Maintenance, Student 5 produced a mean of 96.6%, range 95-100%.
Also shown in Figure 3 is student 5's percentage of on-task behavior on the daily 10-minute prepared worksheet in the math classroom (generality setting). Student 5 was present for 42 of the study's 47 sessions. Figure 3 shows the mean percentage of on-task behavior for student 5 in the math classroom during Baseline was 17.6%, range 0-55%. During Self-monitoring No Audio Cue, the mean was 90.6%, range 75-100%. Finally, during Maintenance, Student 5's mean was 95%, range 90-100%. Figure 4 shows the average percentage of on-task behavior across all students during Baseline, Training, Self-monitoring Audio Cue, Self-monitoring No Audio Cue, and Maintenance in study skills was 20%, 9%, 89.5%, 92.8%, and 97% respectively. In math, the average percentage of on-task behavior across all students during Baseline, Self-monitoring No Audio Cue, was 24.7%, 92.3%, and 95.3% respectively.

Summary. The data indicate that on-task behavior increased for each student in study skills and math when self-monitoring was introduced. Student on-task behavior remained high in the absence of the Audio Cue, and remained high during maintenance, even in the absence of self-recording forms. All students showed a dramatic increase in their overall percentage of on-task behavior when self-monitoring was introduced. Also, the increase was maintained at a high level and stable, throughout the self-monitoring conditions for all students.
Figure 4. Average group percentage of on-task behavior in study skills and math
ACCURACY OF STUDENT SELF-MONITORING

Accuracy of self-monitoring was assessed by comparing the students' completed academic production recording forms with the experimenter's on a daily basis for each session in which the students self-monitored. Using the prepared worksheets as permanent products, the students' total number of items recorded for each session was compared to the total number of items the experimenter recorded. The formula used to calculate the percentage of student accuracy was agreements divided by agreements plus disagreement multiplied by 100.

Figure 5 shows Student 1's percentage of accuracy of self-monitoring for study skills and math. Student 1's mean percentage of accuracy of self-monitoring in the study skills classroom was 95.6%, range 75-100%. In math, the mean was 80.7%, range 12.5%-100%.

Figure 6 shows Student 2's percentage of accuracy of self-monitoring for study skills and math. Student 2's mean percentage of accuracy of self-monitoring in the study skills classroom was 96.9%, range 61.5-100%. In math, the mean was 89.78%, range 46%-100%.

Figure 7 shows Student 3's percentage of accuracy of self-monitoring for study skills and math. Student 3's mean percentage of accuracy of self-monitoring in the study skills
Figure 5. Student 1's percent accuracy of self-monitoring for study skills and math.
Figure 6. Student 2's percent accuracy of self-monitoring for study skills and math.
Figure 7. Student 3's percent accuracy of self-monitoring for study skills and math.
classroom was 96.28%, range 80.8-100%. In math, the mean was 93.9%, range 65.6%-100%.

Figure 8 shows Student 4's percentage of accuracy of self-monitoring for both study skills and math. Student 4's mean percentage of accuracy of self-monitoring in the study skills classroom was 97.1%, range 72.1-100%. In math, the mean was 97%, range 86.2%-100%.

Figure 9 shows Student 5's percentage of accuracy of self-monitoring for study skills and math. Student 5's mean percentage of accuracy of self-monitoring in the study skills classroom was 96.3%, range 76.7-100%. In math, the mean was 90.5%, range 31.2%-100%.

Summary. Results indicate that all students averaged 80% or higher accuracy. However students did not always report the number of items completed consistently. The range of accuracy from 12.5-100% across all students demonstrates the variability. On occasions when subjects did not report accurately the number of items completed during each session, their rate of academic production and percentage of on-task behavior still remained at a high level, suggesting that the accuracy of student self-monitoring was perhaps not as important as the act of self-monitoring itself.
Figure 8. Student 4's percent accuracy of self-monitoring for study skills and math.
Figure 9. Student 5's percent accuracy of self-monitoring for study skills and math.
TEACHER-STUDENT INTERACTIONS

Teacher-student interactions were defined as (a) positive interaction, (b) negative interaction or (c) no/neutral interaction. Teacher-student interaction were also recorded as an individual or group interaction. Table 4 shows teacher-student interactions during the baseline and self-monitoring conditions in the study skills and math classes. Results indicate that during baseline conditions in study skills 5.8% of teacher-student interactions were positive, 0% was negative, 94.2% were no/neutral interaction while 3.8% of the interactions were directed towards the group. During the self-monitoring conditions in study skills, positive teacher-student interaction was .5%, negative and group interactions were 0%, and 99.5% of all interactions were no/neutral interactions.

Data on teacher-student interaction during the baseline and self-monitoring conditions in the math class indicate that 5.6% of the interactions were positive, .27% were negative, 94.1% were no/neutral interaction while 2.8% of interactions were directed towards the group. During the self-monitoring conditions, over ninety-nine percent of all interactions were no/neutral interactions while only .15% were positive, and 0% were negative or directed toward the group. Results indicate
Table 4

Percentage of Teacher-Student Interactions For Each Session During Baseline and Self-Monitoring Conditions in Study Skills and Math.

(+) = Positive  (-) = Negative  (N) = No/Neutral  (G) = Group

<table>
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<tr>
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<th>Baseline</th>
<th>Math</th>
</tr>
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<tbody>
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<td>-</td>
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Mean 5.8 0 94.2 3.8 5.6 .27 94.28
Table 4 continued.

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</tr>
<tr>
<td>31-47</td>
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<td>100</td>
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</tbody>
</table>

Mean | .5 | 0 | 99.5 | 0 | .15 | 0 | 99.8 |
that little Teacher-student interaction took place throughout the study. However, during baseline, higher levels of teacher-student interaction occurred than during self-monitoring.

SOCIAL VALIDITY

Student's responses to questionnaire. Table 5 summarizes the responses of the students to the questions read to them at the end of the study. All of the students indicated that they found this program easy to learn, and useful in their study skills and math classes along with other mainstreamed classes. All students indicated that they would use this program again. However, one student (student 2) indicated that he was neutral as far as enjoying the program and one student (student 1) indicated that he was neutral with respect to the program helping him at home. One of the students (student 5) indicated that "this was the best thing he had done all year". Student 4 asked if they would be able to do it (self-monitoring) again next year.

Teachers' responses. As shown in Table 6 both teachers indicated that they strongly agreed that the self-monitoring program helped their students in the classroom, that it was easy for the students to learn and they enjoyed having the program operate in their classroom. Both teachers were neutral with respect to the program helping their students at home,
Table 5

Student responses to questionnaire (N=5)

<table>
<thead>
<tr>
<th>Summary of questions</th>
<th>Ratings</th>
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<tbody>
<tr>
<td>1. I enjoyed the self-management program.</td>
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</tr>
<tr>
<td>2. I found the self-management program useful.</td>
<td>5</td>
</tr>
<tr>
<td>3. The self-management program was easy to learn.</td>
<td>5</td>
</tr>
<tr>
<td>4. This program helped me in my SLD classroom.</td>
<td>5</td>
</tr>
<tr>
<td>5. This program helped me in my math classroom.</td>
<td>1 4</td>
</tr>
<tr>
<td>6. This program helped me in my other mainstreamed classes.</td>
<td>3 2</td>
</tr>
<tr>
<td>7. This program helped me at home.</td>
<td>1 3 1</td>
</tr>
<tr>
<td>8. I would use this self-management program again.</td>
<td>5</td>
</tr>
</tbody>
</table>

Ratings: 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree
### Table 6

**Teacher responses to questionnaire (N=2)**

<table>
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<th>Summary of questions</th>
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<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. I enjoyed the self-management program operating in my classroom.</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. I found the self-management program useful for my students.</td>
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<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. The self-management program was easy for the students to learn.</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. This program helped my students in the SLD classroom.</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. This program helped my students in the other SLD classroom.</td>
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<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. This program helped my students in other mainstreamed classes.</td>
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<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. This program helped my students at home.</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. I would use this self-management program again.</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. I would recommend this self-management program to my colleagues.</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Ratings: 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree
and one teacher was neutral in regards to the program helping the students in the other SLD classroom.

One of the teachers indicated that "The students who had applied themselves during this time had shown a great deal of progress in other areas of classwork". According to the Study Skills teacher "Student 5 had a tremendous improvement in accuracy of assigned materials, and his attitude was more positive. Student 1 also demonstrated more accuracy in written work, and all students completed more homework assignments in science and history".
CHAPTER V
DISCUSSION

This chapter discusses the findings of this study in relation to the research questions and the review of the literature. The limitations of the study and suggestions for future research are presented.

As stated earlier, this study examined the effect of a self-monitoring procedure on the academic production and on-task behavior of middle school students with learning disabilities. The study attempted to determine whether self-monitoring with and without an audio cue would increase the academic production and attention of five learning disabled students in two special education environments.

Through empirical investigations, self-monitoring has been found to be an effective method in helping students with learning disabilities improve attentional behavior and academic performance (Harris, 1986; Lloyd, Bateman, Landrum, & Hallahan, 1989; Rooney, Polloway & Hallahan, 1985). The findings of this study confirm and extend the results of earlier studies, insofar as students increased their academic
productivity and attentional behavior as a function of self-monitoring procedures (Abbott & Heron, 1988; Blick & Test, 1987; Lloyd, Hallahan, Kosiewicz, & Kneedler, 1982; McLaughlin, 1983; Rooney, Hallahan, & Lloyd, 1984). Specifically, the findings of the present study demonstrated that a functional relationship between self-monitoring and improved student performance was established for all subjects.

When self-monitoring was introduced, performance improved across students, whereas during baseline conditions performance was consistently lower. Also, the data indicate that students can record their academic productivity in other settings in the absence of audible cues, suggesting that self-monitoring can be generalized to other settings. Analysis of student accuracy data showed that students can in fact record credible levels of behavior. While there was some variability among student accuracy, for the most part students were able to record their behavior with a relatively high degree of accuracy. Finally, the students and the teachers involved in the study indicated that they found the self-monitoring intervention enjoyable, useful, easy to learn and that visible improvement was noted.

During the mid 1980’s Hallahan and his associates investigated the relative effects of self-monitoring with a direct focus on academic productivity in comparison to self-
monitoring of attentive behavior. Hallahan et al.'s studies along with Harris (1986) showed that student academic productivity and attentive behavior increased as a function of self-monitoring. However, the findings in regard to the comparison of self-monitoring of academic productivity versus self-monitoring of attentive behavior are not clear. Although data from the Lloyd et al. (1989) study indicated that the self-monitoring of attentive behavior and self-monitoring of academic productivity were not equally effective, the differences were not consistent enough to favor one intervention over the other. Similarly, neither the Rooney et al. (1985) nor Harris (1986) reported differences between the two procedures. Although this study did not compare self-monitoring of attentive behavior and self-monitoring of academic productivity, the findings indicate that student performance improved while self-monitoring their academic production. This finding extends the Hallahan et al.'s studies and the Harris (1986) study by showing that student academic productivity and attentive behavior increased as a function of self-monitoring.

Discussion of Specific Research Questions

Question one. Did self-monitoring result in a higher rate of academic production over a baseline condition in which students did not self-monitor their academic production?
The effect of self-monitoring on the academic production of the five students who participated in the study was clearly demonstrated. For each of the students, academic productivity during the self-monitoring phases increased over academic productivity when students did not self-monitor, and maintenance probes indicated that after the self-monitoring intervention was withdrawn students' rate of academic production was maintained. For the students as a whole, the mean rate of movement during the baseline phase was 9.4 movements per minute. During the Self-monitoring phases, the mean rate of movement was 48.8 movements per minute which represents an average increase for all students of 39.4 movements per minute over baseline conditions. Students' rate of movement per minute during maintenance was 56.

Academic production also increased for all students in both classrooms (study skills and math), and on two different types of assignments. In the study skills class, students worked on a language arts activity that required them to read a passage and answer questions regarding the selection. Movement in this class was considered to be a letter or mark written in the answer space to a question. The average rate of movement for all students during baseline conditions was 9.9. During the self-monitoring phases, student rate of movement increased to 53.3, showing an increase of 43.3 movements per
minute over baseline conditions. Maintenance condition showed a rate of movement per minute of 60.5.

In the math class students worked on an assignment that required them to complete different math problems. Movement in this class was considered to be a numeral or mark written in the answer space to a problem. The average rate of movement for all students during baseline conditions was 9.0. During the self-monitoring phase, student academic production increased to 43.1 movements per minute, showing an increase of 34.1 movements per minute over baseline conditions. Students average rate of movement per minute during the maintenance condition was 51.5.

There were two self-monitoring phases in the study skills classroom: self-monitoring with an audio cue and self-monitoring without an audio cue. Most of the research conducted using self-monitoring as the independent variable has used some form of audio tone to cue the students to record their behavior (Blick & Test, 1987; Harris, 1986; Lloyd, Bateman, Landrum, & Hallahan, 1989). The tones were eventually withdrawn. This study differs methodologically from previous studies insofar as self-monitoring was employed in two different settings. In the study skills setting, experimental procedures were similar to past studies (e.g., Harris, 1986; Lloyd et al., 1989; Rooney et al., 1985) however in the math
setting, students self-monitored their rate of academic production without an audio cue from the outset.

In the study skills setting the average rate of movement per minute across all students during baseline was 9.9. In the self-monitoring audio cue phase students average rate of movement was 45.7, and in the self-monitoring no audio cue phase, students average rate of movement per minute increased to 60.9, an increase of 15.2 movements per minute. With respect to individual students, the average rate of movements varied among students.

Student 3 had an average rate of movement of 53.8 during self-monitoring audio cue and 79.8 during self-monitoring no audio cue. Student 4 increased from an average rate of 58.7 during audio cue to 81.1 during no audio cue. All students increased their average rate of movement between the two conditions. Student 2 however, did not show as dramatic an increase as his peers. His average rate of movement during self-monitoring audio cue was 36.1, and during self-monitoring no audio cue his average rate was 40.7.

Findings from the previous research have shown that students can maintain their rate of academic production when the audio cue is withdrawn. Findings from this study show that student academic production not only can be maintained in the absence of an audio cue but also it can be increased
substantially. The author, however, speculates that there may be more than one variable that led to an increase in academic production during the self-monitoring no audio cue condition. While self-monitoring in the math classroom was performed by the students without an audio cue from the outset, they tended to record their academic production fewer intervals per session. For instance, in study skills, students were required to record their academic production 10 times a session each time they heard the cue "record". In math, students recorded their academic production about 4-5 times per session, and normally when there was a natural break in the assignment (e.g., every 20 problems). When the audio cue was withdrawn in the study skills setting, students tended to record their academic production as they did in the math setting. Instead of recording academic production 10 times they recorded 4-5 times, leaving more time to completing more material on the assignment.

Also, anecdotal records kept by the experimenter showed that two days prior to the withdrawal of the audio cue in study skills, natural contingencies appeared to be operating in the classroom. Students started competing with one another over who could finish the most items for each session. This competition is a phenomenon that many researchers and educators would like to have as a by-product of a procedure. However, in reporting the results, the author cannot state that
for the two days prior to the withdrawal of the audio cue in study skills the independent variable alone was responsible for the change in the dependent variable.

**Question two. Did self-monitoring result in a higher percentage of on-task behavior over a baseline condition in which students did not self-monitor their academic production?**

The effect of self-monitoring of academic production on the on-task behavior of the five students who participated in the study was demonstrated clearly. For each of the students, on-task behavior during the self-monitoring phases showed an increase over on-task behavior when students did not self-monitor, and maintenance probes indicated that after self-monitoring was withdrawn students' rate of on-task behavior was maintained. For the students as a whole, the mean percentage of on-task during the baseline phase was 22.3%. During the Self-monitoring phases, the mean percentage of on-task behavior was 91.8% which represents an average increase for all students of 69.5% over baseline conditions. Students percentage of on-task behavior during maintenance was 96.1%.

While most of the previous research has examined the effects of self-monitoring of attention behavior of students (Abbott & Heron, 1988; McLaughlin, 1983; Hallahan, Lloyd, Kneedler, & Marshall, 1982), few until recently have looked at the effects of self-monitoring of academic production.
(Harris, 1986; Lloyd, Bateman, Landrum, & Hallahan, 1989; Rooney et al., 1985). The findings from the present study indicate that under the conditions of self-monitoring of academic production student on-task behavior dramatically increased. Although students did not self-monitor their attentive behavior, during training conditions, they were given the definition of what behaviors constituted on-task and off-task behavior.

**Question three and four. Was student on-task and academic production behavior after self-monitoring training maintained in the absence of an audible cue and did it extend to another setting?**

Perhaps one of the most important questions that any research study can answer is "Will the strategy generalize", that is, will the relevant behavior be apparent in other settings, at different times, or with other people and under different conditions without the scheduling of the same events in those conditions. Although previous self-monitoring studies of academic productivity has not measured for generality of the procedure, this study lends credibility to self-monitoring as being a powerful intervention that can produce generalized outcomes.

The findings of this study indicate that across all subjects, student academic productivity and on-task behavior
increased and was maintained in a different setting, at a
different time, with a different teacher, and under different
conditions. As stated earlier, the setting used to assess
generality was the math classroom. The differences between
the study skills and the math classroom were apparent. In the
study skills setting, students were given training on how to
record their academic production on a language arts assignment
in the presence of an audio cue (which was later withdrawn).
The classroom teacher had 9 years of teaching experience and a
Master of Arts in reading. The study skills session was
conducted during the sixth period of the day (12:45 PM-1:55 PM)
and there were 7 students enrolled in the class.

In the math setting, students were not given training on
how to record their academic production, but were prompted to
use the recording forms without an audio cue on a math
assignment. The classroom teacher had 2 years of teaching
experience and the math session was conducted during the last
period of the day (2:15 PM-2:25 PM) with 10 students enrolled in
the class. One of the reasons this particular class was used
was because the teacher had difficulty keeping the students
under control. The author speculated that some of the reasons
for lack of control was because of the number and type of pupils
in the classroom, there was one student in particular who was
referred for a SBH unit who continually picked on other students
in the class and constantly talked back to the teacher. Another reason for lack of control was the fact that it was the last period of the day, and there were interruptions from the central office for end-of-the-day announcements.

This study is different from other self-monitoring studies because it did assess for generality. The results show that even under different conditions, student on-task and academic production behavior after self-monitoring training was maintained in the absence of an audible cue. Further improved performance extended to another setting.

**Question five. Did students record their rate of academic production accurately?**

Accuracy of student self-monitoring was assessed by comparing the students' academic production recording forms with the experimenter's on a daily basis for each session in which the students were to self-monitor. Using the prepared worksheets as permanent products, the students total number of items recorded for each session was compared with the total number of items the experimenter recorded.

The data indicate that all students had an average accuracy of 80% or higher. However students were not always consistent in reporting accurately the number of items completed, for example, Student 1's mean percentage of accuracy of self-monitoring in the study skills classroom was
95.6%, with a range of 75%-100%. However in the math classroom Student 1's mean was 80.7%, with a range of 12.5%-100%. While, Student 1's mean percentage of accuracy was high, his range across both settings was 12.5%-100%. The range of accuracy in both the study skills and math class was 12.5%-100% across all students. On the occasions when students did not report accurately the number of items completed during each session, their rate of academic production and percentage of on-task behavior still remained at a high level, perhaps suggesting that accuracy of student self-monitoring was not as important variable as the act of self-monitoring itself (O'Leary & Dubey, 1979).

**Question six. What type and with what frequency of teacher behaviors occurred during baseline and self-monitoring conditions?**

Teacher-student interaction seemed to have little effect on the results of this study because few teacher-student verbal interactions occurred. During Baseline, 5.7% of teacher-student interactions were positive, while .13% were negative and of those interactions that did take place, 3.3% were directed towards the group. No or neutral interactions accounted for 94.1% of the interactions. During the self-monitoring phases, fewer than 1% of positive interactions took place, while 99% of the time no or neutral interactions took place.
The author speculates that some of the reason few interactions took place was because not much interaction was needed for the students to complete their assignments. During baseline the increase in interaction could be due to students not understanding the assignments and/or to misconduct. This was assumed because of the anecdotal recordings of the experimenter. Once training occurred, it seemed that almost all verbal interaction stopped between teacher-student while they worked on their assignments. The limited amount of interaction could have been do to the teacher's perception that the students knew what to do and had a method for doing it. Anecdotal recordings showed that both the students in the study and the other classmates, worked consistently for the 10-minute periods, with a limited amount of interaction even among themselves.

Question seven. What was the consumer satisfaction of self-monitoring as a behavior-change technique?

Another question that is important for a research study to answer is: "To what extent does the study have social validity"? That is, did the strategy make a difference, and if it did make a difference, was it important for the individual and noticeable by others? According to the teachers and students involved, this study was socially valid.
Both the teachers and students completed surveys on the self-monitoring program and the results indicate that their rating of the program were extremely favorable. In comparing self-monitoring of attention and productivity, Harris (1986) found that although results were not significantly different between the two procedures, the students, when given a choice, preferred to self-monitor their academic production behavior. Lloyd et al. (1989) reported data that indicated opposite results of Harris's (1986). That is, when given a choice between self-monitoring of attention and productivity, students in the Lloyd study preferred to self-monitor their attentive behavior. Since the data of these studies could not find any significant difference between the two procedures, perhaps the point to be made is that, students prefer to self-monitor, and the present study confirms this point. Along with the students performance improving, the students also indicated that they enjoyed the program, found it useful in other classrooms and claimed that they would use self-monitoring of academic productivity again.

Teachers indicated that they agreed strongly that the self-monitoring program helped their students in the classroom, was easy for them to learn, and they enjoyed having the program operate in their classroom. Both teachers were neutral that the program helped their students at home, and one teacher was neutral with respect to the program helping the students in the
other SLD classroom. One of the teachers indicated that the students who had applied themselves during this time had shown a great deal of progress in other areas of classwork. According to the study skills teacher, Student 5 experienced tremendous improvement in accuracy of assigned materials, and his attitude was more positive. Student 1 also showed more accuracy in written work, and all students completed more homework assignments in science and history.

Limitations of the Study

This study was limited by the following factors: subject characteristics, absences, setting and times, time of school year and length of study.

Subject characteristics. The subjects in this study were 5 students identified as learning disabled. With the exception of one black student all students were Caucasian. The middle school in which the study was conducted had an enrollment of about 503 students and was located in a rural community about 5 miles outside a large city. Many of the students in the school district had at one time or another lived inside the city and had relocated to a large, lower-income apartment complex located in the community. It is not known to what extent these factors affected the results. Clearly, however, this population is not most representative of the LD population at large.
**Absences.** Two of the students had a number of absences during the study, however, this was consistent with their previous attendance record. Student 2's parents were having marital problems during the study resulting in the mother leaving the home environment and the student missing school. It is not known to what extent the results would have differed had students been present for all sessions of the study.

**Settings and times for the sessions.** The study was conducted in two special education classrooms, although the students were mainstreamed into regular education classrooms for some subjects. The study skills class was scheduled directly after a physical education class, and the math session was the last period of the day. It was beyond the scope of the present study to ascertain how the timing of the classes affected the data. Stated another way, it is possible that the results could have been affected differently if the study skills and math classes had occurred during the morning.

**Time of the school year and length of study.** The study began the second week of March and ran through to the last day of academic school year. Students began to show verbal signs of fatigue in early May and this might have affected their performance. For example, the students would walk into the classroom stating that they did not want to work, and they
continually asked to be excused to go the bathroom or the library during class time.

**Implications**

This study demonstrated that middle-school, learning disabled students can be taught to self-monitor their academic production and that this behavior can be generalized to a different setting under different conditions. The results show that students at the middle school level can learn a skill that is transportable and useful, especially with respect to academic subjects. Teachers can train their student with relative ease and the time to train is minimal. Once trained, student performance can be maintained.

Teachers and students involved in this study indicated that the self-monitoring program used in this study was extremely useful, and the students enjoyed the program and would use self-monitoring techniques in the future. The teachers also liked having the program operate in their classroom. As a result at least two implications can be stated. First teacher training institutions should incorporate in the curriculum strategies to teach pre-service teachers how to use self-monitoring procedures with and without audio cues. Not only can pre-inservice teachers benefit from learning self-monitoring strategies but students and parents can benefit as well.
Second, inservice program should be developed to teach established teachers how to use self-monitoring techniques with their students especially since ease of implementation and the time to train students is minimal. The cost-benefit ratio favors including this topic as part of an overall inservice program.

Parent training programs may also benefit, from training in self-monitoring procedures. During the summer months when students are not in school self-monitoring would be an excellent strategy for helping a child with completion of household chores and assignments. Self-monitoring could also be established with helpings one's child with their homework after school.

Suggestions for Future Research

The use of self-monitoring has generated much interest among practitioners and researchers alike. Self-monitoring is an easy procedure to implement in classroom settings, and its potentially powerful effects on behavior can provide a viable tool for teachers. Self-monitoring without contingent rewards can result in behavior change (Lalli & Shapiro, 1990). Likewise, because self-monitoring does not always produce a desired academic change--for example, self-monitoring of attentive behavior may or may not increase test scores--it is important for researchers to continue to explore and investigate in what
ways self-monitoring can assist teachers and practitioners in predicting when self-monitoring might be feasible to implement.

This study involved only learning disabled students in a suburban middle school. Harris (1986) and Lloyd et al. (1989) studies involved special education students in self-contained classrooms. For the students involved in this study, self-monitoring resulted in improved academic productivity and on-task behavior. Generality occurred in another setting however that setting was another special education classroom, not the more "normalized" general education classroom. Future research needs to address the issue of programming for generality from special education settings to regular education settings. Using the self-monitoring procedure without an audio cue in the regular classroom would be a viable tool for many students who have difficulty getting class assignments completed and would also be unobtrusive.

Future research might also explore the effects of specialized bar coding equipment that would also be unobtrusive in the regular classroom and would also enable researchers to gain quick reliable data.

This particular procedure uses an infrared optic lens about the size of a thick credit card. Students or teachers can use a small TimeWand to record a behavior simply by moving the
wand over a bar code similar to what you find on store merchandise. The data are stored in the memory of the device and at the end of the session the information is uploaded out of the optic lense and into computer and sorted and analyzed by a D-based communications software package. If the goal was to use self-monitoring for learning disabled students in the regular classroom this would provide an efficient transportable device. The initial cost might pose a factor for classroom teachers to consider using a device such as this. However, for the researcher who is interested in recording more than one behavior with more than one subject at a time and grant monies might support a pilot study, the use of bar coding could facilitate the use of self-monitoring by students and the analysis of data for researchers.

A final and important area that needs to be addressed is the issue of maintenance of the self-monitoring procedure. While this study conducted several maintenance probes, it is difficult to determine long range effects. Future researcher's might examine what features of the strategy are critical in producing lasting results or does self-monitoring of attention and self-monitoring of productivity contribute differently to maintenance?
SUMMARY

This study examined the effects of self-monitoring with and without an audio cue as a method to increase academic production and attention with five students with learning disabilities in two special education environments. Academic production, on-task, and generality behaviors were measured.

During self-monitoring in study skills, students were required to assess and score their academic behavior at the audio cue "record", indicating on a form the number of completed responses. The cue occurred for 10-minutes on a random schedule (30s-90s). After training for study skills, students were prompted to take recording forms with them to math class. Generality was assessed in math when students recorded their performance without the audio cue. The cue was eventually withdrawn in study skills, but students continued to use the form.

The data indicate that academic productivity increased for each student in study skills and math as a function of self-monitoring. Student productivity remained high in the absence of the cue. Also, on-task increased substantially for all students when self monitoring was instituted.

This study demonstrated that a functional relationship between self-monitoring and improved student performance was
established for all five students. Also, the data indicate that students can record academic productivity in other settings in the absence of audible cues, suggesting that self-monitoring can be generalized to other settings.
REFERENCES


Appendix A

Example of Prepared Worksheet for Language Arts Class
Kentucky

Kentucky is in the eastern part of the United States. It is called "The Bluegrass State". The state flower is the goldenrod. The state tree is the Kentucky coffeetree. The cardinal is the state bird.

The word "Kentucky" is an Indian word. People think it means "land of tomorrow". The state capital is Frankfort. People who live in Kentucky are called "Kentuckians".

Farmers in Kentucky grow tobacco, soybeans, and corn. They also raise hogs, beef cattle, dairy cattle, and racehorses. Oil, gas, stone, and coal are mined in the state. Machines, tobacco products, paper, and clothing are made in Kentucky. Louisville, Lexington, Covington, Owensboro, and Bowling Green are cities in the state.

People come from all over the world to go to the Kentucky Derby. It is a horse race which is always run on the second Saturday in May. People can also go to many of the farms where the horses are raised. They see many beautiful horses and colts.

Mammoth Cave is one of the world's largest caves. You can go down into the caves and look around. At Fort Knox, the United States keeps its gold in big vaults.

At the place where Abraham Lincoln was born, there is a log cabin. Some people think it might be the real one in which he was born.

There are very big, old houses which have been made to look just like they did long ago. They are in different towns. People can go into them to see what life was like many years ago.

BONUS: Daniel Boone was a famous Kentuckian. On a separate piece of paper, write a short report about Daniel Boone.
1. On what state are you working?


2. Where is this state located?


3. What is its nickname?

4. What is the state flower?

5. What is the state tree?

6. What is the state bird?

7. What does the state name mean? (Where did it get its name?)

8. What is the state capital?

9. What do we call people who live in this state?

10. Name four plants or animals raised on farms in this state.

11. Name three things mined in this state.

12. Name three things made in this state.

13. Name three cities in this state

14. Name three things that bring visitors to this state.

15. What would you like to see if you visited this state?
Appendix B

Example of Prepared Worksheet for Mathematics Class
Name __________________________ Date ______________

1. \( \frac{2}{5} + \frac{2}{5} = \) 
2. \( \frac{5}{8} + \frac{2}{8} = \) 
3. \( \frac{3}{9} + \frac{2}{9} = \) 
4. \( \frac{7}{12} + \frac{2}{12} + \frac{3}{12} = \) 
5. \( \frac{5}{6} + \frac{2}{6} + \frac{1}{6} = \) 
6. \( 3\frac{1}{10} + \frac{4}{10} + 1\frac{1}{5} = \) 
7. \( 3\frac{2}{5} + \frac{4}{8} + 4\frac{1}{8} = \) 
8. \( 5\frac{4}{8} + 3062 + 61,775 = \) 
9. \( 4\frac{1}{12} + 9\frac{3}{10} + 1\frac{1}{12} = \) 
10. \( 9\frac{3}{10} + 4\frac{1}{10} = \) 
11. \( 181 + 498 + 1360 = \) 
12. \( 6.4 + 5.8\) 
13. \( 5.296 + 3.475 = \) 
14. \( 17.318 + 216.907 = \) 
15. \( 8.3945 + 1.1 = \) 
16. \( 62.3 + 0.004 + 3.95 = \)
17. \( 7.83 + 2.465 = \)
Subtract

21. \( \frac{4}{5} - \frac{1}{5} = \) ______

22. \( \frac{5}{6} - \frac{3}{6} = \) ______

23. \( \frac{4}{7} - \frac{2}{7} = \) ______

24. \( \frac{9}{10} - \frac{5}{10} = \) ______

25. \( \frac{3}{5} - \frac{2}{5} = \) ______

26. \( \frac{7}{8} - \frac{5}{8} = \) ______

27. \( \frac{54}{5} - 2 \frac{1}{5} = \) ______

28. \( \frac{7}{8} - \frac{2}{8} = \) ______

29. \( 3\frac{11}{12} - 1\frac{1}{12} = \) ______

30. \( 4\frac{9}{12} - 2 = \) ______

31. \( 1,329 - 388 = \) ______

32. \( 34,806 - 21,731 = \) ______

33. \( 27,000 - 26,001 = \) ______

34. \( 6.23 - 4.75 = \) ______

35. \( 5.724 - 3.931 = \) ______

36. \( 8.300 - 6.415 = \) ______

37. \( 7.200 - 4.375 = \) ______

38. \( 6.527 - 4.800 = \) ______

39. \( 12.397 - 8.492 = \) ______

40. \( 6.422 - 5.197 = \) ______
Appendix C

Student Recording Sheet
For Academic Production
Student Recording Sheet for Academic Production

Directions: When you hear the word "record" mark your worksheet with a slash (/) after the last problem you completed. Count backwards the number of items you finished to the previous slash. Mark that number in the appropriate box on this recording sheet. At the end of the session count the total number of problems completed and put that number in the total box (A). In box (B) enter a decimal point one space to the left. Finally in box (C) write your rate of production per minute.
Example:

<table>
<thead>
<tr>
<th>Total A</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>1.5</td>
<td>1.5</td>
</tr>
</tbody>
</table>

NAME_________________________ DATE_________________________
CLASS_______________________ INTERVENTION__________________

1 2 3 4 5 6 7 8 9 10

<table>
<thead>
<tr>
<th>Total A</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Appendix D

Master Recording Sheet
DIRECTIONS: PLACE STUDENT NAME ABOVE EACH COLUMN, TURN RECORDING SHEET OVER AFTER INTERVAL NUMBER "50" AND CONTINUE RECORDING. OBSERVATION CODES ARE ON REVERSE.
### Codes for Observers

- **On-task behavior:** Student is actively engaged in listening or assignment and holding pencil in writing or creating position.

- **Off-task behavior:** (e.g., student is looking out the window, talking to neighbor, not holding pencil in writing or creating position etc.)


### Teacher-Student Interactions

- **Positive interaction (e.g., teacher performs actions such as making positive comments, providing constructive statements, placing hands on student's shoulders, etc.)**

- **Negative interaction (e.g., teacher scolds or chastises student).**

- **Neutral interaction (e.g., no interaction occurs, or interaction not based on instructional activity).**

- **Group interaction (e.g., teacher interacts with entire group of students, rather than an individual student).**
Appendix E

Exit Interview Forms
Student Survey

Please answer the following questions by circling the number that best describes your opinion about the self-monitoring program. Feel free to write any additional comments.

1-strongly disagree 2-disagree 3-neutral 4-agree 5-strongly agree

1. I enjoyed the self-management program. 1 2 3 4 5
2. I found the self-management program useful. 1 2 3 4 5
3. The self-management program was easy to learn. 1 2 3 4 5
4. This program helped me in my SLD classroom. 1 2 3 4 5
5. This program helped me in my science classroom. 1 2 3 4 5
6. This program helped me in my other mainstreamed classes. 1 2 3 4 5
7. This program helped me at home. 1 2 3 4 5
8. I would use this self-management program. 1 2 3 4 5
Teacher Survey

Please answer the following questions by circling the number that best describes your opinion about the self-monitoring program. Feel free to write any additional comments.

1-strongly agree 2-disagree 3-neutral 4-agree 5-strongly disagree

1. I enjoyed the self-management program operating in my classroom.

2. I found the self-management program useful for my students.

3. The self-management program was easy for the students to learn.

4. This program helped my students in the SLD classroom.

5. This program helped my students in the other SLD classroom.

6. This program helped my students in other mainstreamed classes.

7. This program helped my students at home.

8. I would use this self-management program again.

9. I would recommend this self-management program to my colleagues.
Appendix F

Procedural Reliability Check Lists
TRAINING SESSION

CLASS____________________

DATE____________________

INTERVENTION____________

OBSERVER__________________

Did the experimenter . . .?

1. Train students in unoccupied classroom? yes no

2. Give students the definition of academic productivity and on-task behavior? yes no

3. Give and model examples and nonexamples of what constitutes on-task behavior? yes no

4. Give students a chance to practice and model behaviors that constitute on-task? yes no

5. Give students a chance to practice recording academic production when the tape cued "record"? yes no

6. Have recording forms available to student? yes no

7. Have an assignment for the student to practice with? yes no

8. Provide feedback for accurate self-recording or encourage student to record accurately, whichever is appropriate? yes no

9. Collect recording forms at the end of the session? yes no

NOTES/COMMENTS
SELF-RECORDING SESSION

CLASS______________________________

DATE______________________________

INTERVENTION_____________________

OBSERVER__________________________

Did the experimenter . . .?

1. Have student recording forms available to students? yes no

2. Have master recording forms available to outside observer? yes no

3. Start and stop sessions at appropriate times? yes no

4. Start tape recorder at appropriate time? yes no

5. Did verbal cue "record" sound at the appropriate times? yes no

6. Collect recording forms at the end of the session? yes no

NOTES/COMMENTS
Appendix G

Parental Consent Form
Parental Consent Form

I agree to allow my child to participate in a research study investigating the effectiveness of self-monitoring, as a method for increasing academic achievement. This study will be conducted in the sixth period SLD class, and the eighth period SLD class by Susan R. Abbott, under the direction of Dr. Timothy E. Heron, Professor of Special Education, The Ohio State University. The study will begin the second week of March, 1990, and conclude in May, 1990.

I understand that my child's identity will not be revealed in any publication, document, recording, videotape, photograph, computer storage, or any other form of report developed from this research. I also understand that I may withdraw my consent for my child's participation at any time.

<table>
<thead>
<tr>
<th>Name of Student</th>
</tr>
</thead>
<tbody>
<tr>
<td>Signature of Parent or Guardian</td>
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<tr>
<td></td>
</tr>
<tr>
<td>Date</td>
</tr>
<tr>
<td>Principal</td>
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<tr>
<td></td>
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<tr>
<td>Date</td>
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<tr>
<td>Teacher</td>
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<td>Teacher</td>
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<td>Date</td>
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<tr>
<td>Investigator</td>
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<td></td>
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<tr>
<td>Date</td>
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<tr>
<td>Advisor</td>
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<tr>
<td>Date</td>
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Appendix H

Training Script
Student Training Script

Below is a training script for a student self-monitoring procedure. Training will be conducted on an individual basis by the experimenter with each student in the study. Training will take place in an unoccupied classroom over two twenty minute sessions. During the first session students will be given the definition of academic productivity and on-task behavior with specific examples of what constitutes (+) on-task and (0) off-task behavior. Students will be given the chance practice recording their academic production. A recording form will be distributed and the student will be asked to record their academic productivity when the tape cued "record". Students will be praised for accurate recording, or encouraged to record accurately which ever is appropriate. The second session will consist of a review of the subsequent training session and the student will again practice accurate self-recording when the tape cues "record".

EXP: (Student's Name) I have been observing the students in the classroom and I have been taking data on your on-task behavior. Do you know what I mean by on-task behavior?

STD: (Opportunity for student to respond)

EXP: I am going to give you a definition of what on-task behavior is and then I am going to show you the data that I have taken on your on-task behavior. On-task behavior for the purpose of this study is defined as being actively engaged in: Looking at your assignment and holding your pencil in a writing or erasing position.

EXP: Off-task behavior includes all other behaviors not mentioned. For example, looking out the window, talking to a
neighbor, not holding your pencil in a writing or erasing position. Do you have any questions?

STD: (Opportunity for student response)

EXP: (Show student a graph of his baseline data). This is a graph of what I have observed since I have been in your classroom, this is a record of your on-task behavior. What do you see?

STD: (Hopefully, student will respond with something like, a low amount or percentage, not very good, etc.)

EXP: Today what I would like to do is show you how to improve your on-task performance. One way to increase your on-task performance is a minute. I also have a graph of the amount of problems you have been doing in the SLD study review skills class. (Show student the graph). What do you see?

STD: (Student response)

EXP: Today I am going to show you how to self-record your rate of productivity so that you will know how many problems you can complete in 10-minutes. If you can increase your academic and on-task performance, it is very likely that you can improve your grades, hassles with teachers over incomplete assignments could decrease, your chances of entering more regular classrooms would probably improve, and your parents and you would probably be a lot happier. Before we get started do you have any questions?

STD: (Opportunity for student response)

EXP: Hand student a student recording sheet and a practice worksheet, have them fill in the spaces for date, class, and name. Read the directions on how to record, and then model the format by: marking the assigned worksheet with a slash at the sound of "record" and counting backwards the number of items
completed to the previous slash or beginning of worksheet, whichever is appropriate, and marking that number in the appropriate box on the student recording sheet when the audio cue "record" sounds. Explain how to total the number of problems completed and express it as rate of production per minute and then model the format. When finished, have the student explain the procedures (helping when redirection is needed) and then allow student to practice using the audio cue. When student has completed the task have him or her total the number of problems completed and express it as a rate of productivity.

EXP: Reinforce students who record with high accuracy or encourage to record more accurate, whichever is appropriate. Explain to the students that recording accurately is important because as the experimenter you will be conducting random spot checks during the intervention:

After the session has ended thank the student for his or her cooperation and tell him or her that we will meet again tomorrow to review the material we just went over and we will practice recording academic production to the verbal cue "record" again tomorrow.
Session II

EXP: Hi, (students name), today I would like to review a few things with you that we went over yesterday. First of all can you tell me how to record academic production (give student necessary materials)? Help with redirecting statements where needed. Let student practice procedure with audio cue.

STD: (Opportunity for student response, and practice).

EXP: Yesterday we also talked about on-task and off-task behavior can you tell me what on-task behavior is?

STD: (looking at the teacher, reading, writing, talking to the teacher).

EXP: Good, can you tell me what off-task behavior is?

STD: (writing a letter to my friend, looking out the window, walking around the classroom when I am supposed to be in my seat, talking to a neighbor when I am supposed to be reading an assignment, etc.).

EXP: After the session has ended thank the student for his cooperation and ask if he has any more questions. Explain to the student that he will be recording his academic production rate in the study review SLD classroom and you would like for him to continue to record not only academic rate but also on-task behavior in other classrooms.