The Effects of Audiotape Self-Monitoring on Direct Instruction Teacher Presentation Techniques

Kay D. Simon Brynildson

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THE EFFECTS OF AUDIOTAPE SELF-MONITORING ON DIRECT INSTRUCTION TEACHER PRESENTATION TECHNIQUES

by

Kay D. Simon Brynildson

A Project Report
Submitted to the
Faculty of The Graduate College
in partial fulfillment of the requirements for the Degree of Specialist in Education
Department of Psychology

Western Michigan University
Kalamazoo, Michigan
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Prior research has shown that several Direct Instruction teacher presentation techniques are functionally related to student academic achievement. Unfortunately, variability exists in the implementation of Direct Instruction programs with regard to these critical teaching skills. Monitoring of Direct Instruction teachers appears necessary to ensure program effectiveness. The present study employed a multiple baseline across subjects experimental design to evaluate the effectiveness of audiotape self-monitoring in improving and maintaining five Direct Instruction teacher presentation techniques: clear signalling, pacing, corrections, contingent reinforcement and student accuracy. The subjects were two middle school special education teachers who taught Direct Instruction corrective reading programs. Both teachers improved with all of the skills they were performing at below-criterion levels prior to beginning self-monitoring. The results indicate that audiotape self-monitoring is a viable method of assisting teachers in improving and maintaining teaching skills that are critical to the effectiveness of Direct Instruction programs.
ACKNOWLEDGEMENTS

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Appreciation is due also to Galen Alessi, Jack Michael, and Wayne Fuqua who have helped me to think carefully and critically about this project and about behavior in general.

Finally, I want to acknowledge my son, Matt, for lending me his computer to have in my office for over a year. This made writing enormously more convenient. I also wish to thank him for bearing so well with the stresses and strains of the past several years.

Kay D. Simon Brynildson
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The effects of audiotape self-monitoring on direct instruction
teacher presentation techniques

Simon Brynildson, Kay D., Ed.S.
Western Michigan University, 1990
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CHAPTER I

INTRODUCTION

"To teach is to edify in the sense of build... Teaching is the expediting of learning; a person who is taught learns more quickly than one who is not" (Skinner, 1968, pp. 4-5).

It appears that better teaching—the kind that expedites learning—is needed in American schools. Keller (1981) warned that:

The entire field of education is in trouble, especially in the United States. It has failed to carry out its basic function of transmitting culture from one generation to the next... We simply have not done the job of teaching that we should have. (p. 295)

The National Commission on Excellence in Education (1983) reported indicators of "unilateral disarmament" (p. 4). Unfortunately, the commission's recommendations included little information about how to improve teaching.

Others, however, have viewed this question as crucial to effective education (e.g., Becker, Engelmann & Thomas, 1975; Berliner, 1987; Brophy, 1979; Paine, Radicchi, Rosellini, Deutchman, & Darch, 1983; Rosenshine, 1976, 1987). Becker et al. (1975) stated it this way: "Education can be better. We need to throw away many of the labels used as excuses for teaching failures and look more closely at the process of instruction to be sure teaching is happening" (p. 237).

Carnine, Granzin, & Becker (1988) proposed that "although instruction is a complex process with a massive literature... there is a body of convergent findings that suggest that it is possible to specify the characteristics of... good teaching" (p. 327). These findings are the result of a proliferation of research on teaching often called process-product research (Brophy, 1979; Brophy & Good, 1986).
Based upon process-product research findings, Rosenshine (1983) asserted that students who receive their instruction directly from the teacher achieve more than students who are expected to learn new skills on their own or from each other. He also concluded that, in general, teachers are most effective when they structure the learning; proceed in small steps but at a brisk pace; give detailed and redundant instructions; ... provide many examples; ask a large number of questions and provide overt, active practice; provide feedback and corrections; ... have a student success rate of 80% or higher in initial learning; divide seatwork assignments into smaller assignments; provide for continued student practice so that students have a success rate of 90%-100% and become rapid, confident, and firm. (pp. 336-337)

Brophy and Good (1986) cautioned that most process-product research findings must be qualified by context variables such as grade level, type of objective, and type of student; however, they asserted that two common themes cut across the findings and apply to any body of knowledge or set of skills that has been sufficiently well organized and analyzed:

One is that academic learning is influenced by amount of time that students spend engaged in appropriate tasks. The second is that students learn more efficiently when their teachers first structure new information for them and help them relate it to what they already know, and then monitor their performance and provide corrective feedback during recitation, drill, practice, or application activities. ... Drill and practice activities should not be slighted as "low level." They appear to be just as essential to complex and creative intellectual performance as they are to the performance of a virtuoso violinist. (pp. 366-367)

One particular set of curricular materials and instructional practices that embodies the convergent findings of process-product research is referred to as Direct Instruction, and is based on carefully scripted programs designed by Siegfred Engelmann and colleagues and published by Science Research Associates ([SRA] Carnine et al., 1988). Two basic premises underlie the Direct Instruction model:

(a) that the rate and quality of children's learning in the classroom is a function of environmental events; and (b) that educators can increase the amount of children's learning in the classroom by engineering carefully
the details of students' interaction with that environment. (Becker, Engelmann, Carnine, & Rhine, 1981, p. 98)

Direct Instruction components include: (a) organization of instruction, (b) program design, and (c) presentation techniques (Carnine & Silbert, section 1.2, 1979).

Organization of instruction is critical for maximizing academic-engaged time (Rosenshine & Berliner, 1978). The Direct Instruction model emphasizes scheduling ample time and managing the classroom so that the schedule can be effectively implemented.

Program design incorporates several important aspects:

1. Specifying objectives--stating them as specific observable behaviors.

2. Devising problem-solving strategies and providing sufficient practice and range of examples necessary for generalization to occur.

3. Developing teaching procedures which translate the strategies into formats that specify exactly how the teacher is to present the strategy. "Detailed formats free teachers from design questions and enable them to focus their full attention on the students' performance" (Carnine & Silbert, 1979, p. 15).

4. Sequencing skills--determining an optimal order for introducing new information.

Direct Instruction recognizes the need for different teacher presentation techniques for different skill levels of students (Becker et al., 1981); however, especially for younger children, the techniques that characterize the model are:

1. Small group instruction--which allows for a great deal of teacher feedback to students.

2. Unison oral responding--which facilitates a high degree of active student involvement.
3. Signalling students when to make a response—which enables all students to participate on cue, thus blocking slower students from copying faster students.

4. Appropriate pacing—which contributes to student attentiveness and reduces errors.

5. Careful monitoring—which involves systematically scanning from student to student yet focusing primarily on lower-performing students.

6. Diagnosis and correction—which involves determining the specific skill deficits that cause the errors, correcting all errors immediately and teaching to mastery criterion.

7. Motivation—which involves arranging for student success and reinforcing perseverance.

Research on Direct Instruction has clearly demonstrated that it is effective in enhancing academic gains of students. For example, in Project Follow Through, one of the largest social experiments ever conducted, the academic achievement of Direct Instruction students was well above that of students in all of the other instructional models that were compared (see Becker & Carnine, 1981; Gersten, Carnine, & White, 1984; Gersten, Woodward, & Darch, 1986).

To ensure the effectiveness of Direct Instruction, the programs should be carefully implemented following program specific guidelines, procedures, and presentation techniques. Siegel (1974) found a functional relationship between newly trained teachers' behaviors and student academic achievement in a Direct Instruction language program and thereby demonstrated the need for fidelity of implementation of Direct Instruction programs. This necessary condition for program effectiveness has been verified by other researchers who have found considerable variability in implementation among more experienced Direct Instruction teachers (Gersten, Carnine, & Williams, 1982; Gersten, Carnine, Zoref, & Cronin, 1986).
findings strongly suggest the need for monitoring of Direct Instruction teachers in order to ensure fidelity of program implementation and thereby to safeguard program effectiveness.

To deliver Direct Instruction programs as prescribed, a combination of teaching skills is required. The individual skills (i.e., Direct Instruction presentation techniques) that have been shown to be functionally related to student academic performance include: (a) rapid pacing; (b) frequent praise; (c) clear and precise signals; (d) consistent, immediate corrections of incorrect responses; and (e) maintaining high student accuracy rates (see Carnine, 1981; Carnine & Fink, 1978; Gersten et al., 1982).

In summary, better teaching is needed in American schools. Direct Instruction exemplifies better teaching. Fidelity of implementation of Direct Instruction programs is critical to their effectiveness, yet it is not always found. Therefore, monitoring of Direct Instruction teaching is needed. The present study is concerned with monitoring the skills of Direct Instruction teachers in order to provide for skill correction and maintenance.

One efficacious monitoring mechanism is factual (objective) feedback (e.g., Cooper, Thomson, & Baer, 1970; Good & Brophy, 1974).

The data for factual feedback pertaining to Direct Instruction teacher skills can be derived from audiotape recordings. Hosner (1980) demonstrated the effectiveness of feedback from observers in maintaining tutors' Direct Instruction teaching skills. After recording tutoring sessions on audiotapes, observers coded process measures of instruction (teachers' skills) and provided tutors with corrective feedback and praise. In this study, intermittent (once every four sessions) feedback was shown to be equally as effective as continuous (every session) feedback in maintaining tutors'
skills. Educationally and statistically significant gains in reading skills were made by students in both the continuous and the intermittent conditions.

In a related study, Cottrell (1986) showed that videotape monitoring, in which observers scored videotapes of two Direct Instruction teachers and then provided them with feedback, was effective in improving the teachers' skill levels. It was suggested that by utilizing videotapes, this technique would enable monitors to do their observations at their own convenience. Thus, instructional monitoring would become more feasible under the prevailing circumstance of a paucity of individuals in schools that are available for carrying out this task.

However, the availability of instructional monitors for providing feedback to teachers is typically so extremely low (Alfonso, Firth, & Neville, 1981, chap. 1) that even with the convenience of videotapes it is unlikely that monitoring will take place. Huddle (1985) stated that "the ongoing observation of teaching . . . is considered a pillar of educational excellence. Despite this, teaching remains essentially a private activity rarely interrupted by external scrutiny" (p. 59). Although Direct Instruction classrooms in the Follow Through Project have typically been carefully monitored to ensure fidelity of program implementation, Direct Instruction programs in other classrooms (e.g., in the Kalamazoo, Michigan area) often have no systematic monitoring of key instructional variables. Therefore, a feedback system which will enable Direct Instruction teachers to monitor their own classroom performances is needed (cf. Thomas, 1971, p. 103).

The viability of a feedback system such as this has been indicated by researchers who have demonstrated the effectiveness of videotape self-monitoring in modifying various teacher behaviors. Saudargas (1972) analyzed the effect of videotape feedback on establishing criterion rates of teacher praise. The data indicated that having teachers count, graph, and attempt to meet two different criterion rates of
academic approvals effectively increased and decreased teacher rates. Rule (1972) studied three teacher behaviors: praise, on-task contacts, and off-task contacts. A multiple baseline design was employed to test the effects of videotape self-monitoring compared to the effects of two other procedures. It is likely that sequence effects and other extraneous variables confounded the experimental effects in this study; however, the results of videotape self-monitoring were similar to the results attained in the Saudargas study in that it increased teacher praise. It also increased on-task and decreased off-task contacts.

It appears possible that a Direct Instruction self-monitoring technique could enable teachers to receive feedback on skills that are critical to the effectiveness of these programs and thereby assist them in improving those skills. Such a technique would have to be easy to use so that teachers could fit this additional task into their already overloaded schedules (J.C. Mencarelli, special education teacher, Milwood Middle School, Kalamazoo, MI). For this reason, intermittent (weekly) rather than continuous (daily) monitoring would be preferred, and audiotape recording, which requires much less equipment than videotape recording, also would be favored.

The present study examined the effectiveness of an audiotape intermittent self-monitoring technique in assisting Direct Instruction teachers in improving and maintaining five critical Direct Instruction teaching skills.
CHAPTER II

METHOD

Subjects

Two subjects participated in the study. One, Teacher A, was a 44-year-old male middle school special education teacher who used the Direct Instruction Decoding C materials of the SRA Corrective Reading Program (Engelmann, Meyers, Johnson, & Carnine, 1988). He had been doing Direct Instruction teaching during the full 4 1/2 years of his total teaching experience and had a broad background of training with Direct Instruction presentation techniques. He participated in an earlier study (Cottrell, 1986) four years prior to the present study in which several of the same teaching skills were measured.

The second subject, Teacher B, was a 42-year-old female certified regular education teacher. She was employed as a special education teaching assistant at the time of the study, and worked several hours each school day in Teacher A's classroom. She used the Direct Instruction Decoding B2 materials of the SRA Corrective Reading Program (Engelmann, Meyers, Carnine et al., 1983). She had been doing Direct Instruction teaching for the last two years of her total 12 years of teaching experience. She had had much less training with Direct Instruction presentation techniques than Teacher A.

Setting

The study took place in a 7th grade special education classroom in an inner-city middle school in western Michigan. It was conducted with two reading groups of
two to six students each during Direct Instruction teaching sessions. The students in both classes ranged in age from 12 to 15 years, and all were labeled either emotionally impaired or learning disabled, the majority being in the former category. All of the students had at least one year of previous experience being instructed with Direct Instruction programs. The classroom was highly structured. Many visual prompts, including posted rules, reminded the students of how they should behave. An incentive system, beyond the usual grading system found in classrooms, was in effect. It involved administering behavior specific praise and bonus points to students contingent on appropriate behavior and academic achievement. A wide variety of backup reinforcers were available to be traded for the bonus points.

Apparatus and Materials

Videotape recording of teaching sessions was done using VHS video cassettes with an RCA VHS video cassette recorder, model VJP170, and an RCA color video camera, model CC017, mounted on a tripod. An RCA television monitor, model JJR950W, was used for viewing the videotapes.

Audiotape recording was done simultaneously with the videotape recording on audio cassettes with a Bell and Howell cassette tape player/recorder, model 3174A, that was plugged into the audio out jack on the video recorder.

An observation form (see Appendix A) was used to systematically collect performance data on teacher and student behavior from the recordings of teaching sessions.

For self-monitoring, the subjects were provided with a worksheet that detailed the scoring procedures and provided spaces for recording their skill rates and comparing them to the criterion rates (see Appendix B). A troubleshooting checklist (see Appendix C) was also provided to aid the subjects in self-monitoring.

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Dependent Variables

The five dependent variables (see Table 1) were Direct Instruction teaching skills that have been shown to be functionally related to student academic performance. Fidelity of implementation of Direct Instruction programs exists, with regard to presentation techniques, when criterion levels (delineated in Table 1) of these performance variables are present (see Carnine, 1981; Carnine & Fink, 1978; Gersten et al., 1982). Each of the five skills is really a composite of several behaviors that combine to form the skill. The unit of analysis for this study was necessarily the more molar skills rather than their component behaviors. A self-monitoring technique that would require recording the component behaviors would be too time-consuming to have utility for teachers. Typically, during initial Direct Instruction training, teachers are taught to perform the necessary behaviors that combine to result in mastery of the skills. The troubleshooting checklist provided to the teachers during self-monitoring delineated many of these component behaviors.

Three of the behaviors observed—those related to clear signalling, pacing, and student accuracy—were student behaviors. Because this study is concerned primarily with teacher behavior, a rationale for observing student responses rather than teacher behaviors for these variables is provided, as follows:

1. With regard to clear signals, the teacher behavior involved must, by definition, evoke a \textit{simultaneous} group response from students. Therefore, one way to count clear signals is to count simultaneous group responses that follow teacher signals.

2. With Direct Instruction, there should be a direct correspondence between the teacher's rate of task presentation and the rate of student responding. Counting
student responses in order to measure pacing provides a means of checking that this correlation exists.

Table 1
Definition of Variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Related Unit of Measurement</th>
<th>Criterion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clear Signals</td>
<td>Simultaneous student group responses during instruction that are evoked by a visual or auditory antecedent stimulus (e.g., a hand drop signal) provided by the teacher (as prescribed in the teacher's manual) following the presentation of a task.</td>
<td>90% of session signals are clear</td>
</tr>
<tr>
<td>Pacing</td>
<td>All student responses (individual and group) that follow a teacher's signal or request for a response, including group responses that are not simultaneous.</td>
<td>9 responses per minute</td>
</tr>
<tr>
<td>Corrections</td>
<td>Two types: (1) signal error corrections, which must occur immediately after one or more students respond too early or too late (i.e., before or after the other students) or not at all, and involve the teacher pointing out that an error was made (e.g., &quot;you're late&quot;) and re-presenting the task until all students respond together; and (2) content error corrections, which must occur immediately after a student gives an incorrect response or after all students fail to respond, and involve a model, test, retest procedure (as prescribed in the teacher's manual) directed toward the whole group.</td>
<td>85% of session errors are corrected</td>
</tr>
<tr>
<td>Contingent Reinforcement</td>
<td>Praise statements or expressions of approval (e.g., &quot;That's great,&quot; or &quot;Yes!&quot;) spoken by the teacher following a correct student response during instruction.</td>
<td>2.8 occurrences per minute</td>
</tr>
<tr>
<td>Student Accuracy</td>
<td>Group and individual responses during instruction that follow a teacher signal and are both simultaneous among students (if group responses) and contain no incorrect student responses.</td>
<td>85-90% of session responses are correct</td>
</tr>
</tbody>
</table>

3. Why measuring student accuracy involves recording student responses should be obvious; however, how it relates to teacher behavior requires explanation.
Student accuracy is considered a teaching skill because it can be controlled by the teacher (Gersten, Carnine et al., 1986; Youngmayr & Madigan, 1985) purportedly through the correct performance of the other four critical teaching skills as well as by using other tactics emphasized by the Direct Instruction model. These tactics include, for example, appropriately placing students in homogeneous (in terms of skill levels) small groups, seating the students so that they all can see the teacher and the teacher can see all of them, seating the lowest performers closest to the teacher, continuously monitoring all the students (see Berliner, 1987) using a scanning technique, and teaching to mastery criterion. These and other components skills related to student accuracy were included in the troubleshooting checklist (see Appendix C) provided to the subjects during self-monitoring.

Observation and Scoring Procedures

One observation session of approximately five minutes duration was conducted each day, one to four days a week. The sessions alternated between Teacher A and Teacher B. All sessions were simultaneously video- and audiotaped in order to ensure that any subject reactivity to the recording instruments was held constant throughout the study. After every observation session, the researcher scored the videotape. Frequency counts were used to score the behaviors related to the dependent variables. Each group response was counted as just one response, and each individual response was considered one response. During group responding, if one or more students in the group made an error the response was considered an error response, regardless of how many students responded correctly. Thus, the criteria for student accuracy were quite stringent. Experimental scoring procedures were the same as those delineated in Appendix B for teacher self-monitoring, except that the observers also noted the content of student responses on the data collection form.
This was done to facilitate interobserver agreement checks. After scoring, the observational data were analyzed to yield rate data on the dependent variables using the formulas included in Appendix B.

Observer Training and Reliability

An experienced Direct Instruction teacher/trainer was selected as the expert observer for the study in order to assess interobserver agreement and accuracy of experimental observations. He and the primary observer used several pre-experimental videotapes to calibrate their measurement using the data collection form. These videotapes were also used to check the expert observer's intra-observer agreement. He scored five pre-experimental videotaped sessions two times each, with an interval of at least two days between each rescoring. His observations were compared trial by trial. Agreement trials were divided by agreements plus disagreements. All variables had to be scored identically within a trial in order for the trial to be considered in agreement. Mean agreement for all five sessions was 86.3%. For the last two of the five sessions, mean agreement was 88.4%.

Interobserver agreement during the experiment was assessed by having the expert observer score randomly selected videotaped sessions. Then, the primary observer's scoring of the same sessions was compared, trial by trial, to the expert's. Again, trials had to be scored identically in order for them to be considered in agreement, and agreements were divided by agreements plus disagreements. Interobserver agreement was assessed for 30% (9 of 30) of the experimental sessions, five during baseline and four during intervention. Total agreement averaged 82.9%; baseline agreement averaged 82.1%; intervention agreement averaged 84.0% (overall range: 75.5% to 90.2%).

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Experimental Design and Procedures

The study was conducted during the word attack portion of the reading lesson during the second period of the school day for both subjects. The researcher was responsible for operating the recording equipment.

Baseline and intervention conditions were introduced in a multiple baseline across subjects design (Baer, Wolf, & Risley, 1968). With this design, intervention effects are evaluated by introducing the intervention to different baselines (persons in this case) at different points in time. "If each baseline changes when the intervention is introduced, the effects can be attributed to the intervention rather than to extraneous events" (Kazdin, 1982, p. 126).

During baseline sessions the recording equipment, but no other new contingencies, was in place. The researcher began baseline for Teacher B the day after it was begun for Teacher A and recorded seven sessions of baseline data on Teacher A and 11 sessions of baseline data on Teacher B. For two of Teacher B's baseline sessions the data were discarded because of extraneous variability imposed by the absence of all but one student during those sessions. After baseline performance was stable for both subjects, the self-monitoring intervention was initiated with Teacher A while baseline continued for Teacher B. When Teacher A's performance again stabilized, the same intervention was begun with Teacher B and continued with Teacher A. Intervention was conducted over eight observation sessions for Teacher A and over six observation sessions for Teacher B.

Prior to beginning the intervention with each subject, the researcher spent 1-2 hours training the subject to self-monitor. The Corrective Reading Series Guide (Johnson, 1988) was used to review the critical teaching skills (dependent variables) with the subjects and then the self-monitoring technique was explained, including:
(a) scoring procedures, (b) calculating skill rates, (c) criterion skill levels, and (d) use of the troubleshooting checklist.

During the intervention, the subjects usually scored one 5-minute audiotape of one of their own teaching sessions per week, on randomly alternating days of the week. They then calculated their rates for each of the dependent variables for that session. The troubleshooting checklist was used at their own discretion to aid them in identifying ways of improving their teaching skills. The researcher informed the subjects of which sessions they were to self-monitor, after those particular teaching sessions were completed. The subjects were requested to complete each self-monitoring session within 24 hours of the teaching session that they were scoring. The researcher then collected their completed data collection form. The subjects kept the worksheets that they used for recording their rates so that they had a running record of their progress throughout the self-monitoring intervention.

Following each self-monitoring session, the rates the subjects recorded for their teaching skills were compared to the rates the researcher obtained by scoring the videotape of the same session. This was done in order to assess whether or not the subjects were receiving accurate feedback about their skill levels through self-monitoring.
CHAPTER III

RESULTS

Subject Performance

Table 2 presents rate data for the five dependent variables for Teacher A and Teacher B (all rates except those for contingent reinforcement are rounded to the nearest whole number). During self-monitoring, Teacher A's mean skill rates increased by 19 percentage points for clear signals, 65 percentage points for corrections, and 12 percentage points for student accuracy; they decreased by .4 occurrences per minute for contingent reinforcement; and they stayed the same for pacing. Teacher B's mean skill rates during self-monitoring also increased for clear signals, corrections and student accuracy by 35, 70 and 23 percentage points respectively. Unlike Teacher A, Teacher B's mean rate for contingent reinforcement also increased--by 2.2 occurrences per minute--and her mean pacing rate decreased--by 6 responses per minute.

Figures 1-5 illustrate the changes in skill rates for the five dependent variables across baseline and self-monitoring phases for Teachers A and B.

For the percentage of clear signals per observation session (see Figure 1), there was a great deal of variability in Teacher A's performance during baseline followed by an immediate rate increase at the onset of self-monitoring with subsequent generally stable, criterion level performance thereafter in this phase. Teacher B's clear signalling performance began far below the criterion during baseline and was followed by an upward trend in this phase but immediately increased substantially to
near criterion level at the onset of self-monitoring and remained near that level thereafter in Phase 2.

Table 2

Means and Ranges of Teaching Skill Rates During Baseline and Self-Monitoring

<table>
<thead>
<tr>
<th>Teaching Skill</th>
<th>Teacher A</th>
<th>Teacher B</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Baseline</td>
<td>Intervention</td>
</tr>
<tr>
<td></td>
<td>Mean</td>
<td>Range</td>
</tr>
<tr>
<td>Clear Signals</td>
<td>68%</td>
<td>39-89%</td>
</tr>
<tr>
<td>Pacing</td>
<td>13</td>
<td>10-17</td>
</tr>
<tr>
<td>Corrections</td>
<td>5%</td>
<td>0-13%</td>
</tr>
<tr>
<td>Cont. Reinforcement</td>
<td>3.3</td>
<td>1.8-4.5</td>
</tr>
<tr>
<td>Student Accuracy</td>
<td>70%</td>
<td>62-76%</td>
</tr>
</tbody>
</table>

For the number of student responses per minute (pacing) per observation session (see Figure 2), Teacher A's rate was about the same, and was generally above the criterion level, during both baseline and self-monitoring; however, during self-monitoring there was a gradual upward trend in the rate with less variability. Teacher B's pacing rate was also above the criterion level during both phases of the experiment; however, it was highly variable during baseline and lower, but much less variable and in an upward trend, during self-monitoring.
Figure 1. Percentage of Clear Signals per Observation Session for Teachers A and B.
Figure 2. Number of Student Responses per Minute (Pacing) per Observation Session for Teachers A and B.
Figure 3. Percentage of Student Errors Corrected per Observation Session for Teachers A and B.
Figure 4. Number of Occurrences of Contingent Reinforcement per Minute per Observation Session for Teachers A and B.

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Figure 5. Percentage of Correct Student Responses (Student Accuracy) per Observation Session for Teachers A and B.
For the percentage of student errors corrected per observation session (see Figure 3) both subjects' rates were stable at near zero levels during baseline and both increased dramatically at the onset of self-monitoring. The rates generally continued in an upward trend during this phase, approaching and exceeding the criterion level at several points.

For the number of occurrences of contingent reinforcement per observation session (see Figure 4), Teacher A's rate was usually close to or above the criterion level during both baseline and self-monitoring. Teacher B's rate was usually below the criterion level during baseline. It immediately increased at the onset of self-monitoring and remained consistently above criterion level performance thereafter.

For the percentage of correct student responses (student accuracy) per observation session (see Figure 5), both subjects' rates were fairly stable and below the criterion level during baseline, both immediately increased to near criterion upon onset of self-monitoring, and both remained fairly stable for the duration of Phase 2.

Increases in levels of Teacher B's rates for clear signals, contingent reinforcement and student accuracy occurred at the onset of self-monitoring for Teacher A.

The self-monitoring phase was interrupted for a two-week period following Session 22 due to a school schedule change to accommodate parent/teacher conferences, followed by a spring break. Corresponding decreases occurred in skill rates for both subjects with clear signals, corrections, and student accuracy, and with contingent reinforcement for Teacher A.

Teacher A self-monitored six teaching sessions and Teacher B self-monitored four. Table 3 presents the mean absolute differences and the range of differences between the subjects' recorded rates and the experimentally observed rates. Negative range amounts indicate subject-recorded rates that were lower than experimentally
observed rates, and positive amounts indicate the opposite. With contingent reinforcement and pacing, the subjects usually scored themselves lower; with clear signals and student accuracy, they scored themselves higher and lower approximately an equal number of times. The major discrepancy between subject-derived and experimentally-derived rates was with corrections. The subject-derived rates were usually much higher, particularly in the earlier sessions. Therefore, the decision was made to give the subjects feedback regarding this discrepancy following the first two sessions of self-monitoring for each subject (i.e., after Session 14 for Teacher A and after Session 24 for Teacher B). It was thought to be unlikely that the subjects' skill with corrections would improve more if they did not see the need for more improvement. The feedback consisted of informing the subjects of the discrepancy and reminding them of what constituted a proper correction. This, of course, added another component to the self-monitoring technique.

Table 3
Means and Ranges of Differences Between Subject-Reported Skill Rates After Self-Monitoring and Experimentally Observed Rates for the Same Sessions

<table>
<thead>
<tr>
<th>Teaching Skill</th>
<th>Teacher A</th>
<th></th>
<th>Teacher B</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>Range</td>
<td>Mean</td>
<td>Range</td>
</tr>
<tr>
<td>Clear Signals</td>
<td>2.7</td>
<td>-7.0 to +3.0</td>
<td>5.9</td>
<td>-5.5 to +8.9</td>
</tr>
<tr>
<td>Pacing</td>
<td>3.2</td>
<td>-5.6 to +1.7</td>
<td>3.1</td>
<td>-5.5 to -1.1</td>
</tr>
<tr>
<td>Corrections</td>
<td>34.8</td>
<td>-42.8 to +75.0</td>
<td>10.5</td>
<td>-6.7 to +22.3</td>
</tr>
<tr>
<td>Cont. Reinforcement</td>
<td>0.7</td>
<td>-1.7 to +0.5</td>
<td>0.4</td>
<td>-0.6 to +0.6</td>
</tr>
<tr>
<td>Student Accuracy</td>
<td>5.1</td>
<td>-6.4 to +16.1</td>
<td>5.2</td>
<td>-8.6 to +4.9</td>
</tr>
</tbody>
</table>
Subject Satisfaction

Assessment of the teachers’ satisfaction with the self-monitoring technique was done using a questionnaire which asked them the following questions:

1. What are your likes and dislikes regarding the self-monitoring technique?
2. Did you find the troubleshooting checklist to be helpful in self-monitoring or did you rarely or never use it?
3. Was self-monitoring too time-consuming?
4. Are you still using the technique, or, if not, do you plan to use it again in the future?

In summary, the teachers reported that the technique is fast, easy to use and "keeps you consistent with the format." They said the scoring worksheets made it easy to observe progress and focus on areas that needed improvement. The only dislike mentioned was that the technique "points out how difficult it can be to stay with the format when you have resistant learners." Both teachers reported that they used the troubleshooting checklist and one said it made improvement easier. One teacher stated that the technique was not overly time-consuming and the other reported that at the beginning it was too time-consuming but took less time with practice. To date, neither teacher has self-monitored since the study ended because of "time and equipment constraints at the end of the school year." However, both teachers reported that they plan to use the technique at the beginning of the next school year and thereafter.
CHAPTER IV

DISCUSSION

The results of the present study indicate that audiotape self-monitoring is a viable method of assisting teachers in improving and maintaining teaching skills that are critical to the effectiveness of Direct Instruction programs. Both teachers improved all of the skills they were performing at below-criterion levels prior to beginning self-monitoring. With corrections, both teachers improved dramatically.

All improvements were maintained throughout the self-monitoring phase with the exception of temporary reductions with both teachers for clear signals, corrections, and student accuracy after the schedule interruptions that occurred following Session 22. Teacher A’s rate of contingent reinforcement also decreased notably at this point. These decreases were likely caused by several factors surrounding the disruption of the usual classroom routine, including the inadvertent withdrawal of self-monitoring. After parent/teacher conferences and spring break were over, and the regular schedule and self-monitoring were back in place, the skill rates increased again.

The increases in Teacher B’s rates for clear signals, contingent reinforcement, and student accuracy that occurred at the onset of self-monitoring for Teacher A could have been due to the influence of Teacher A’s improved performance on Teacher B. The teachers taught their reading groups at the same time, in the same classroom, within earshot of each other. These improvements were not great enough to meet the criterion levels for clear signals nor for student accuracy, and they appeared to be unenduring for contingent reinforcement and only moderately enduring for student
accuracy. No improvement at all occurred at this juncture with Teacher B's corrections skill, and her pacing rate increased slightly for only one session.

Although the subjects performed above the criterion level with pacing during both phases, less variability occurred with both teachers for this skill during self-monitoring. Thus, it may be inferred that self-monitoring improved the subjects' consistency of pacing.

Although the subjects' pacing rates remained above the criterion level during self-monitoring, they both decreased at the onset of this phase. This could have been a function of the increase in thinking time needed to improve their skills and perhaps also the additional time it took to correct more student errors. These rate decreases, however, were likely temporary, as indicated by the upward trend in the data for both teachers during self-monitoring.

The improvements in student accuracy rates during self-monitoring may not appear substantial, as depicted in Figure 5. However, if considered relative to the standard A through F grading scale, for which a 10% difference usually means at least a difference of one grade, then the 12 and 23% improvements, with Teachers A and B respectively, take on more meaning.

The data in Table 3 indicate that the teachers were able to measure most of their teaching skills fairly accurately using audiotapes of their teaching sessions. This is a noteworthy finding considering the relative ease of using an audiotape recorder versus using videotaping equipment. The data also indicate that there is some room for error within the teachers' scoring of their skills. Self-monitoring was effective despite discrepancies between subject-derived and experimenter-derived rates. However, it is unlikely that this would be as true had the experimenter not given the subjects feedback about their substantial scoring discrepancies with the corrections skill. It appears necessary to have an outside observer monitor the accuracy of the
teachers' scoring after self-monitoring is initiated in order to avoid the effects of erroneous feedback on the subjects' skills. It is important to note, however, that observer feedback regarding scoring discrepancies was given to each subject only one time during the self-monitoring phase, and for just one of the teaching skills.

The findings of the present study are similar to those of Cottrell (1986) who demonstrated the effectiveness of videotape monitoring with frequent observer feedback in improving Direct Instruction teachers' skills. However, it now appears that teachers can improve their skills by self-monitoring with less feedback needed from another observer. This is an important finding considering: (a) the functional relationship between Direct Instruction teachers' skills and student academic achievement (Gersten et al., 1982; Gersten, Carnine et al., 1986; Siegel, 1974), and (b) the paucity of individuals available to conduct instructional monitoring in schools (Alfonso et al, 1981, chap 1; Huddle, 1985).

As previously noted, Teacher A was one of the subjects in the Cottrell (1986) study. When that study ended, his rates for four of the teaching skills were: 80% for corrections, 12 responses per minute for pacing, 80% for clear signals, and 90% for student accuracy. In contrast, his mean baseline rates during the present study for these four skills were: 5% for corrections, 13 responses per minute for pacing, 68% for clear signals, and 70% for student accuracy. Clearly, substantial decreases in his rates occurred for three of the teaching skills in the time between the studies when no skill monitoring took place. There was a reduction of 75 percentage points for corrections, 12 percentage points for clear signals, and 20 percentage points for student accuracy. This apparent drift in Teacher A's skills is further evidence that teacher skill monitoring is necessary in order to ensure fidelity of implementation of Direct Instruction programs.

Further research should be conducted in order to answer the following concerns:
1. Will teachers who have been trained to use the self-monitoring technique continue to use it effectively without outside supervision/monitoring? If not, can a feasible program of supervision be developed to achieve this objective?

2. How often should self-monitoring be done? Is once a week more than necessary? When self-monitoring was inadvertently withdrawn for two weeks during the intervention phase of the present study, corresponding decreases occurred in skill rates for both subjects. However, other variables surrounding the schedule changes that necessitated the withdrawal may have been functional in bringing about the skill reductions. Therefore, the necessary frequency of self-monitoring remains to be empirically demonstrated.

3. A component analysis is needed in order to determine which aspects of the self-monitoring technique are functional in increasing teachers' skill rates. If fewer components are necessary to bring about improvement, then perhaps self-monitoring can be even more readily implemented by teachers.

4. The question of whether the efficacy of the self-monitoring technique has generality across subjects, settings, and longer durations of time needs to be addressed. Some evidence of generality across subjects exists in the present study because the teachers had differing degrees of training and experience with Direct Instruction teaching skills. With regard to settings, it seems likely that the technique might be even more effective with teachers working with student populations other than the emotionally impaired. These students were frequently resistant to responding appropriately.
Appendix A

Data Collection Form
Data Collection Form

Teacher____ Observer____ # Students____ Program_______ Lesson ____

Date Taped____ Time Taping Began____ Time Taping Ended____

Date Scored____ Time Scoring Began____ Time Scoring Ended____

CODE:
B = Correct Group Response  
I = Correct Individual Response  
S = Signal Error  
C = Content Error

CIRCLE THESE AS THEY OCCUR, WITH ONE EXCEPTION:
FOR INDIVIDUAL RESPONSES WITH CONTENT ERRORS, CIRCLE BOTH THE "S" AND THE "I."

SLASH THE CIRCLED "S" OR "C" IF THE ERROR IS CORRECTED IMMEDIATELY.
PUT A CHECK IN THE BOX BOTTOM IF CORRECT RESPONDING IS REINFORCED.

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Appendix B

Scoring Procedures for Direct Instruction Self-Monitoring
Scoring Procedures for Direct Instruction Self-Monitoring

TEACHER'S NAME_________________ DATE______________________________

You will use the data collection form to score your teaching skills. Fill in the date and the time on the top of the form, then begin playing the tape. You will score every teaching trial. Each box on the data collection form corresponds to one trial. A trial consists of one (group or individual) student response which has been preceded by a teacher task presentation. After each student response (with one exception) you should circle either the "G," "I," "S," or "C" in the box for that trial. Circle "G" for a correct group response or "I" for a correct individual response. Circle "S" if a signal error occurred. Circle "C" if a content error occurred. Here is the exception: For individual responses with content errors circle the "C" and the "I" together. If an error occurs listen for whether the error is immediately and appropriately corrected. If it is, put a slash over the circled "S" or "C" in the box. If a response is correct and is followed by verbal reinforcement, then put a check in the space in the bottom of the box. Move to the next box for each successive trial. You will have to replay segments of the tape in order to be able to score the whole session. When you are done, fill in the time your scoring session ended on the top of the form and then calculate your skill rates using the formulas below.

Formulas:

\[
\text{Clear} = \frac{\# \text{ corr grp resps} + \# \text{ grp resps w/content errors}}{\text{total # of group responses}} \times 100\% \\
\text{Signals} = \frac{\# \text{ signals}}{\text{total # of responses}} \times \frac{\text{duration of tape (in minutes)}}{\text{duration of tape (in minutes)}} \times 100\% \\
\text{Pacing} = \frac{\# \text{ corrected errors (slashed circles)}}{\text{total # of incorrect responses}} \times 100\% \\
\text{Corrtd} = \frac{\# \text{ occurrences of contingent reinf}}{\text{duration of tape (in minutes)}} \times \text{CRs/min} \\
\text{Student Acc} = \frac{\# \text{ of correct responses}}{\text{total # of responses (correct + incorrect)}} \times 100\% \\
\]

Here are a few more scoring guidelines:
1. Student errors that are spontaneously corrected by students during individual turns should be scored as content errors.
2. If all of the students in the group fail to respond following a task presentation, this is to be scored as a content error.
3. If both a signal and a content error occur with the same response, score it as a signal error.
4. Score an "OK" statement as a contingent reinforcer.

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Appendix C

Troubleshooting Checklist for Direct Instruction
Teacher Self-Monitoring
Troubleshooting Checklist for Direct Instruction
Teacher Self-Monitoring

Corrections

___ Teacher made corrections IMMEDIATELY after errors (did not allow students to finish incorrect responses).

___ Teacher corrected the WHOLE GROUP when errors occurred, whether they were individual or group errors.

___ Corrections were neutral in delivery.

___ Corrections were concise.

___ Teacher identified types of errors made, and used appropriate corrections for those types of errors:

Teacher used general corrections for:

___ a. Signal violations (e.g., "You’re late; let’s try it again.")

___ b. Nonresponding (e.g., "I have to have everybody; let’s try it again.")

___ c. Nonattending (e.g., "All eyes on the board; let’s try it again.")

___ Teacher used general corrections AND specific corrections (when given in script) for content errors.
(General form: MODEL, TEST, RETEST, DELAYED TEST)

___ Teacher used delayed tests to firm group and individuals.

Student Accuracy

___ Students were appropriately placed in homogeneous (in terms of skill levels) small groups.

___ Class was seated in semi-circle (everyone could see and hear teacher and see board; teacher could see and hear all students).

___ Group faced least distracting area of room.

___ Lowest performers were seated the closest to the teacher.

___ Continuous monitoring of all students was done by scanning back and forth from right to left.

___ Teacher gave individual turns in an unpredictable order.

___ At least 50% of individual turns were given to lowest performers.
Teacher repeated an exercise (and presented it to the whole group) when individual turns indicated that students were not firm.

Mastery criterion teaching: Exercises were repeated until ALL students mastered them (whole exercises completed with no errors).

Teacher precisely followed lesson formats.

Teacher presented entire exercise without skipping tasks.

Teacher presented tasks in correct sequence.

Teacher used correct wording specified for tasks.

Teacher followed directions specified for tasks.

Teacher emphasized important words.

Teacher used the teacher's guide as an ongoing training vehicle.

Teacher administered periodic Program Mastery Tests and retaught lessons if necessary, as indicated by the Mastery Test guidelines.

Clear Signals

Teacher followed the rule: TALK FIRST, THEN SIGNAL.

Teacher watched students' eyes and mouths when signalling.

Teacher used signals whenever they were specified.

Teacher corrected for signal violations as needed; he/she required that ALL students answered on signal.

Teacher delivered signals correctly with appropriate pauses.

Pacing

Teacher rehearsed scripts, then presented them quickly, accurately, and without constantly looking at the book.

Teacher wrote words on board before class.

Teacher had all necessary materials ready and on hand.

Teacher started lesson on time.

Teacher began the directions for the next question or correction immediately after students made a response.
Teacher required students to respond in normal voices, for example, teacher corrected for overly loud responding.

Teacher required students to respond at a normal rate, for example, avoiding droning, dragging responses.

Teacher paused for a longer period of time before signalling on difficult tasks, that is, she/he provided adequate thinking time to minimize student errors.

Teacher did not rush students requiring them to answer before they had time to determine the correct response.

Teacher limited irrelevant discussion.

Teacher did not repeat tasks unnecessarily.

Teacher completed lesson.

Contingent Reinforcement:

Teacher praised with appropriate voice inflection.

Teacher used short, specific verbal praise.

Praise was given frequently.

Teacher praised whole group and individuals.

Teacher targeted individual and group praise toward demonstrated academic skills and improvement.

Teacher praised when students got it right after corrections.

Teacher distributed praise throughout the lesson.

Teacher maintained a ratio of four positive to one negative statement throughout the lesson.

Teacher dealt with disruptive behavior in a firm but neutral manner (e.g., avoided raising voice).

Teacher ignored inappropriate behavior which did not interrupt the lesson.

Teacher used one student’s inappropriate behavior as a cue to praise another student’s appropriate behavior.

Teacher was enthusiastic.

Teacher maintained a pleasant business-like attitude.
Date: January 8, 1990
To: Kay D. Brynildson
From: Mary Anne Bunda, Chair

This letter will serve as confirmation that your research protocol, "The Effectiveness and Utility of an Audiotape Self-Monitoring Technique in Maintaining Direct Instruction Teaching Skill", has been approved under the exempt category of review by the HSIRB. The conditions and duration of this approval are specified in the Policies of Western Michigan University. You may now begin to implement the research as described in the approval application. You must seek reapproval for any changes in this design.

The Board wishes you success in the pursuit of your research goals.

xc: H. Farris, Psychology

HSIRB Project Number 89-11-22

End Date of Approval January 8, 1991


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