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ABSTRACT

Two student self-management techniques, student charting and student selection of instructional activities, were applied to ongoing data-based program modification. Forty-two elementary school resource room students were assigned randomly (within teacher) to one of three treatment conditions: Teacher Chart-Teacher Select Instructional Activities (TC-TSA), Student Chart-Teacher Select Instructional Activities (SC-TSA), and Student Chart-Student Select Instructional Activities (SC-SSA). Statistical analyses indicated that the SC-SSA group improved on all three dependent measures of words read correctly from passages, whereas the TC-TSA and SC-TSA groups each improved on two of these. Also, the SC-SSA group was the only treatment condition that improved on the standardized reading test measure. Implications for making substantive changes in instructional plans are discussed. (Author)

University of Minnesota

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Institute for Research on Learning Disabilities

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Abstract

Two student self-management techniques, student charting and student selection of instructional activities, were applied to ongoing data-based program modification. Forty-two resource room students were assigned randomly (within teacher) to one of three treatment conditions: Teacher Chart-Teacher Select Instructional Activities (TC-TSA), Student Chart-Teacher Select Instructional Activities (SC-TSA), and Student Chart-Student Select Instructional Activities (SC-SSA). Statistical analyses indicated that the SC-SSA group improved on all three dependent measures of words read correctly from passages, whereas the TC-TSA and SC-TSA groups each improved on two of these. Also, the SC-SSA group was the only treatment condition that improved on the standardized reading test measure. Implications for making substantive changes in instructional plans are discussed.

Two Student Self-Management Techniques Applied to Data-Based Program Modification

Recently, student management in education has received considerable attention in the research literature. Researchers have investigated nearly every factor that could reasonably be manipulated by students rather than teachers in an effort to ascertain the effects of self management. The ways in which students have taken responsibility in managing their own education are numerous and fall basically into two categories: assisting in data collection/data recording, and assisting in decision making, such as selecting interventions and reinforcers. Student self-management procedures have a number of benefits: (a) saving teacher time; (b) teaching new skills; (c) fostering independence; and (d) motivating students (Lovitt, 1973).

One of the potential outcomes of student self management is to boost teacher efficiency and to make it more logistically feasible for a teacher to maintain a frequent measurement system (Fuchs, Wesson, Tindal, Mirkin, & Deno, 1981). Special education teachers are, in essence, caught in a double-bind as they are mandated to individualize instruction (P.L. 94-142) and also expected to monitor progress on student goals which, some argue, requires continuous data collection if the procedures are to meet the spirit as well as the letter of the law (Deno & Mirkin, 1980). Therefore, the application of a teacher time saving procedure in special education may be especially beneficial.

A second benefit of student self-management techniques is the number of skills and concepts learned in conjunction with these

procedures. For example, in order to carry out self monitoring and some self-reinforcement procedures, the student must be able to count.

A third reason for incorporating self-management techniques into the classroom setting is to foster independence. As Lovitt (1973) explains:

> When instruction is devoted to the development of self-management behaviors, as well as to the acquisition of academic skills, it is possible that individuals will be optimally capable of using the academic skills learned. (Lovitt, 1973, p. 16)

Kurtz and Neisworth (1976) point out that the benefit of fostering independence is very important to children in special education. They claim that self-management techniques will promote normalization and integration into regular education. Self-management techniques can help the student to become increasingly responsible for his or her own learning.

The final reason for emphasizing pupil self management is that self management may be a motivator (Lovitt, 1973; Thorsen & Mahoney, 1974). There is some evidence that suggests that when students are allowed to manage some of their own behaviors, they are reinforced (e.g., Brigham, 1979; George & Kindall, 1976). In fact, students will work very hard for the opportunity to self manage. With self management as a reinforcer, teachers have a larger set of reinforcers from which to choose and no longer need to rely on tangible or activity reinforcers. Potentially, teachers can use self management to reinforce academic and social behavior as well as to train independent skills.

Given the number of benefits associated with self-management

techniques and their magnified utility in the field of special education, further research in this area is warranted. In the present study, two self-management techniques that have yielded mixed results in past investigations were examined. Specifically, the procedures employed in this study were student self charting and student selection of instructional activities. Previous studies conducted on each of these procedures are reviewed below.

Self Charting

Several classroom studies have included student self charting as an independent variable. Lovitt (1973) discusses two projects in which students charted their own scores. The first of these projects was a single case study. The subject, a 12 year old boy, went through a series of nine phases. During each phase his rate of correct answers was recorded each week in reading, math, spelling, writing, language arts, and social studies. The two phases of primary interest, seven and eight, involved graphing his own data. During the two-week phase seven, he graphed the data for two academic areas and his correct rate dropped slightly. During the three-week phase eight, he plotted his own scores in four academic areas and his correct rate increased from 2.5 correct answers per minute to 4.0 correct answers per minute. However, any interpretation of these results must be made cautiously since two and three data points per phase is not adequate to determine the trend of the data. Therefore, the results from this first study must be regarded as tenuous. Lovitt's second project involving self charting was conducted with nine second grade students who progressed through a series of self-management steps. Self

charting was among these steps, but was not isolated as a separate variable for analysis. Thus, in both of these studies, the effect of self charting as a separate factor cannot be clearly determined.

Frumess (1973) included self charting in her study, which focused on the effect of two self-management strategies on math achievement. In one treatment group (Teacher Chart), the teacher charted the scores and set the performance aim; in the other treatment condition (Student Chart), the subjects, eight and nine year old boys, charted their own scores on six cycle graph paper and the teacher set the performance aim. The Student Chart group performed significantly better than the Teacher Chart group, based on the change scores generated from pre and posttesting on a standardized math test. These results clearly showed that self charting is an effective self-management technique.

Paquin (1978) illustrated similar results in a single case multiple baseline design. After a two week baseline, a nine year old girl was allowed to graph her accuracy rate in reading and then two weeks later in math. The charting was done on equal interval graph paper and was unstructured. The student was encouraged to use artistic license on her graph and the charting was unmonitored. The results indicated that self charting was especially powerful in reading; the correct rate rose from a mean of 9.5 in baseline to 17.8 during treatment. The mean correct rate also increased in math but to a lesser degree. The means were 17.3 during baseline and 21.0 during self graphing. For phonics and spelling, where self charting was not used, the correct rate was stable throughout the seven week study (mean of 5.6). The author contends that self charting was "a simple,

effective and efficient tool for classroom use."

Fisher (1980) also had children self chart. In this study, however, the subjects were 13-17 year old patients in recreation therapy. Their charting consisted of narrative recording of their behavior in daily activities and responding to the therapist's notes on their charts. The author noted that self charting resulted in the establishment of on-going treatment goals formulated by the cooperative efforts of both patient and therapist and increased communication and understanding.

Self charting as a self-management technique has yielded mixed results. Lovitt's (1973) results were spurious, yet Frumess (1973) and Paquin (1978) found significant results. However, Paquin and Frumess must be conservative in their support for self charting since the baseline period and control condition in the respective studies did not include visual inspection of the graph. Therefore, the effect of self charting cannot be separated from the effect of viewing a graphic display of progress. It is possible that access to viewing one's chart may be an important influence, as was demonstrated by Jenkins, Mayhall, Peshka, and Townsend (1974).

In the Jenkins et al. (1974) study, two treatment conditions were compared for six to nine year old learning disabled students. In one condition, behavior of the students was measured daily but the results were not shared with the teacher or student. In the other condition, daily data were charted by the student and discussed with the teachers. Using a split-domain list of words, all six learning disabled students received both conditions daily in balanced order

over the 10 day study. The charted feedback condition was clearly superior to the no feedback condition: charted feedback resulted in a steeper slope of words correct.

Brandstetter and Merz (1978) also investigated the effects of charting and feedback to no charting in two separate studies. In the first study, charting was done on linear graph paper, whereas in the second study semilog charts were used. In both studies, the fourth grade classes were divided in half and alternated between cha ing and recording of raw scores. In both studies the dependent measure was the average raw score gain per trial (day) on the rate sheets from the Science Research Associates series Cracking the Code. Results were significant in the first study but were not in the second. The authors did not compare the two methods of charting since the two groups in the studies were not comparable. However, charting on linear graphs was clearly superior to the no charting treatment. Given these two studies, it is apparent that the effects of self charting must be tested against the effects of a treatment condition in which students have access to their charted data. Otherwise, the self chart treatment is confounded with the effect of feedback provided by looking at graphed data.

Student Selection of Instructional Activities

George and Kindall (1976) reported a study in which each experimental student was allowed to choose how many and which activities they would engage in from various learning packages designed to teach geometry. The teacher made these decisions for the control students. The subjects were high school students, 29 females

and 31 males. The dependent data were posttest scores on the four learning activity packages (LAPs) used throughout the eight week study, the time required to complete the LAPs, and student attitude toward learning and school. Results indicated no significant differences in the posttest scores of students who selected their own activities and students required to complete each of the four LAPs decreased as the students progressed through the four LAPs regardless of the treatment condition. The semantic differential technique used to elicit attitudes yielded statistically nonsignificant results although the tendency was for students to prefer student choice. Students reported that the system that allowed them to choose activities was more interesting, more enjoyable, less time consuming, more conducive to self understanding, permitted better content recall, and made them feel that teachers were more confident in them. The authors concluded that student directed learning was as effective and efficient as teacher directed learning and also a more positive experience for the students.

Taffel (1976) also experimented with student selection of academic activities. In an experiment with three treatment groups, Choice, No Choice, and Control, the number of math problems completed and the time spent working were dependent data. During the last half of a tutoring session, students in the Choice treatment were allowed to select a special arithmetic activity if they completed a specified number of math problems in the first half of the tutoring sesion. In the No Choice condition, students could also earn the opportunity to do a special activity, but the experimenter selected the activity for

the student. The control students worked on standard math problems for the entire tutoring session regardless of their performance. Results indicated no statistically significant difference between the treatment groups on either dependent variable. However, a significant increase in the number of problems completed by the Choice group during the treatment condition over the pretreatment condition was noted. The set of activities from which the Choice group was allowed to choose was designed to include some attractive and some less attractive options. The interaction of choice and attractiveness could not be adequately assessed. Therefore, a second experiment was conducted in which all activities were designed to be fairly unattractive. The results of the first experiment were not replicated. The author concluded that in order for selection to produce positive effects, the options must be at least moderately attractive.

Two dimensions of the learning setting, teacher versus student selected tasks and working alone or in pairs, were manipulated in a study conducted by Jackson (1978). Four treatment conditions were established: Teacher-assigned Singles; Teacher-assigned Pairs; Student-selected Singles; and Student-selected Pairs. Based on behavior stream specimen records, time on task and quality of time were observed and analyzed. Teacher-assigned versus student-selected tasks was not a significant factor affecting quality of or amount of time on task. All students spent a high percentage of time on task, but children working in pairs had higher quality time and worked more independently than children working alone.

Within an aptitude x treatment interaction framework (Cronbach & Snow, 1977), Greene (1976) tested the assumption that when given an opportunity to structure their own learning, students would make choices that would facilitate the attainment of educational goals. One hundred sixty-five students in nine fourth and fifth grade classrooms participated. Stratifying by sex, all children in each class were randomly assigned to either a Choice or No-choice group. The students in the No-choice group completed one lesson per day, in order, from The Thurstone Letter Series Problems workbook and were evaluated by the experimenter. Students in the Choice group worked in the workbook during free time, completed the lessons in the order of their choice, and corrected and evaluated their own performance. Pretest scores included two cognitive measures, pretests in the workbook, and Lorge-Thorndike scores, as well as four motivational aptitudes: expectancy of success, importance of success, causal attributions, and evaluative orientation. Posttest information was collected on a letter problems criterion test, causal attributions for performance in the workbook, and interest in learning more about letter series problems. Results supported the predicted positive interrelationships among the aptitudes and the ability to make "wise" decisions for Choice students high in motivation and cognition. The Choice students maintained higher scores on the affective measures. Also of interest were findings that indicated that low ability, high confidence children performed significantly superior to low ability, low confidence students. Most importantly, high ability students made more progress in the Choice treatment and low ability students made

most progress in the No-choice condition.

Kosiewicz, Hallahan, and Lloyd (1981) hypothesized that providing the opportunity for a learning disabled student to select an instructional strategy within a structured situation would result in improved performance. They hoped this procedure would help "to combat the apparent passivity of the student with learning problems" (p. 281). They tested this hypothesis using a single subject design (ABCBC) consisting of the following phases: baseline, teacher choice, student choice, teacher choice, and student choice. During the four experimental phases, one of two instructional techniques was applied to improve handwriting. The first was a self-instructional approach in which the subject read a paragraph of rules about handwriting. The second approach was a self-correction procedure in which the eleven year old student circled his own correctly printed letters and words. The dependent measure was the percent of possible points on a daily writing assignment earned by correct lettering and spacing. Visual analysis of the graphic display of these dependent data indicated that performance improved when either handwriting procedure was used, and that student selection was superior to the teacher selection procedures.

The findings from these five studies focusing on the effects of student selected instructional activities were inconsistent. Kosiewicz et al. (1981) found self selection superior to teacher selection for an LD boy. Yet Jackson (1978) found no effects. George and Kindall (1976) found no difference in performance but significant effects with respect to student satisfaction. Taffel (1976) found

that the attractiveness of the task options was important and Greene (1976) demonstrated that the characteristics of the student involved was a necessary consideration. Thus, student selection of instructional activities must be investigated further to determine whether and under what conditions it may be an effective procedure.

Method

Research Questions

The research questions posed for this investigation were: (a) What is the effect of student charting versus teacher charting on student achievement? (b) What is the effect of student selection of instructional activities versus teacher selection of instructional activities on student achievement?

Subjects

Subjects for this study were 42 elementary students from a rural special education cooperative school district. Students were selected from the caseloads of eight resource teachers who had agreed to participate in the study. To be eligible for participation, students had to be in grades 3 to 6 and receive at least 30 minutes of reading instruction daily in the resource room. Students receiving reading instruction in resource rooms in this special education cooperative school district are eligible for special services if they read at least two times fewer words per minute than their regular education classmates. Potential special education students and a random selection of students in the same grade and same school read the same passages from a basal text and the average rate of the regular education students is compared to that of each of the targeted

students. This procedure is described in greater detail elsewhere (Marston, Tindal, & Deno, 1982).

Of the 42 subjects, seven were girls and 35 were boys. The number of subjects per grade was 11, 12, 8, and 11, for grades three, four, five, and six, respectively. The median number of years these students had been in special education was three. The time allocated to reading in the resource room varied from 30 to 90 minutes daily for the 42 students. Specifically, 14 students spent 30 minutes, 8 spent 45 minutes, 2 spent 50 and 55 minutes each, 14 spent 60 minutes, one spent 75 minutes, and one 90 minutes. The majority of the students' school day was spent in regular education classrooms.

Of the eight teachers participating in the study, seven were female and one male. Their prior experience in special education ranged from 0 to 11 years.

Procedures

Training. Teachers were trained individually by the experimenter as to how to work with students in each of the treatment conditions. Training was facilitated by a set of instructions. The experimenter met with each teacher in his or her classroom to review the instructions and answer any of the teachers' questions. In addition, teachers were requested to call the experimenter if they had any doubts about what to do. The experimenter initiated weekly contact, either by phone or in person, with each of the teachers throughout the nine week study.

Prior to the beginning of this study, these teachers were trained in the use of measurement procedures during a week-long workshop prior

to the preceding school year and semi-weekly workshops during the year. At the onset of the present study, the teachers had been implementing a monitoring system for one and one-half school years. This system is described below.

Daily measurement consisted of one-minute timed samples of reading from the basal reading texts used in the district. For this study, 12 students were measured in Ginn 720, 18 in Houghton-Mifflin, and 12 in Scott Foresman. Two methods of measuring and charting were used, mastery and performance measurement. For the students in this study, 35 were monitored with mastery measurement and seven with performance measurement.

In performance measurement, the measurement task is a random sample of items from a large pool of material, and the goal is to improve the level of performance on that material. Figure 1 illustrates performance measurement. The abscissa (horizontal axis) represents school days and the ordinate (vertical axis) represents the rate of performance on the measurement task; each data point represents the rate of performance on a given day. The line of best fit through the data depicts the student's rate of improvement in performance on the pool of material.

Insert Figure 1 about here

Figure 2 depicts mastery measurement. Here, the abscissa represents school days and the ordinate represents successive segments or objectives of the curriculum mastered; each data point represents

the number of curriculum segments mastered on a given day. The line of best fit through the data points depicts the rate of student progress through the curriculum. The goal of repeated mastery assessment is to increase the student's rate of mastery in the curriculum. The teacher measures the student on a random sample of material from the current instructional curriculum unit until mastery is achieved, at which point the student's level of instruction progresses to the next segment in the hierarchy, and the pool of material on which the teacher measures the student also progresses to the next segment in the hierarchy.

Insert Figure 2 about here

Regardless of which measurement system teachers used, the long-range goals were written in the same format. Teachers measured each child's reading performance in successively easier or more difficult material until they identified the LRG level, the level in which students read at entry level criteria (20-29 words per minute for Grade 2 or 30-39 words per minute for Grades 3-6). After this level of the curriculum was identified, the teachers wrote the LRG using a prespecified minimal criterion of 50 words per minute for grade 2 and 70 words per minute for grades 3-6. (See Figure 3.)

Insert Figure 3 about here

Short-term objectives were based on the long-range goals (LRG).

In computing the short-term objective (STO) using a performance measurement system, teachers first subtracted the baseline level of performance from the criterion level listed in the LRG. Dividing this difference by the number of weeks necessary until the annual review, they arrived at the number of words per week gain necessary to meet the long-range goal criteria. When writing mastery measurement STOs, teachers measured the students in successively easier levels of material until the level in which the student met the LRG criterion (50 or 70 wpm) was identified. The teacher then counted units (pages or stories) between this already mastered material and the LRG material. The number of units to be mastered was divided by the number of weeks specified in the LRG and this figure became the STO. The format used for writing performance and mastery measurement short-term objectives is shown in Figure 4.

Insert Figure 4 about here

In addition, the teachers also were trained in the use of the measurement procedures for evaluation of the instructional program. Teachers measured student progress three times a week and plotted the data on a graph. In order to monitor student growth, the baseline reading level and the long-range goal were connected by an aimline that showed the students' desired progress. Every seven data points, the teachers were to monitor student growth by means of the split-middle or quarter-intersect method (White & Haring, 1980). An example is given in Figure 5. If the student was progressing at a rate

equivalent to or greater than that indicated by the aimline, the instructional program was continued; if the projected rate of growth was less than that indicated by the aimline, teachers were directed to make a substantial change in the student's program.

Insert Figure 5 about here

For the present study, teachers were trained to modify this system in two ways. First, all students were to be shown their graph as the data were plotted and some children were trained to plot their own data points. Second, the changes in the student's reading program were to be chosen from a set of reading activities supplied by the experimenter and students in one of the three treatment conditions chose their own instructional activities.

At the beginning of this study, a set of step-by-step directions for 12 reading activities was distributed to each teacher along with directions for each of the three treatment conditions. Each teacher worked with an equal number of students in each of the three treatment conditions. Two teachers worked with three students (1 per treatment condition) and six teachers worked with six students (2 per treatment condition). These three treatment conditions are described below.

Teacher Charts--Teacher Selects Activities (TC-TSA). At the onset of the study, teachers reviewed eight of the 12 activities and selected two activities that they judged would be most effective for each student. These two activities were implemented and data collected three times each week. After the data were collected, the

student watched as the teacher charted the data, and then the teacher showed the student the graph. If, according to the data utilization strategy, a change in instruction was needed, the teacher reviewed four more instructional activities and chose one to replace one of the original two activities that were selected. The teacher reviewed four activities each time the data indicated a change in instruction was necessary and chose an activity to replace one of the two previously implemented.

Student Charts--Teacher Selects Activities (SC-TSA). This treatment condition was the same as TC-TSA with respect to the teacher's selection of reading activities. However, the students charted their own oral reading scores. The teacher told students what their scores were and helped the students find the appropriate place to mark the chart if needed. The student plotted the data and drew a line from the new data point to the last data point except when there was a change in the instructional plan.

Student Charts--Student Selects Activities (SC-SSA). As in SC-TSA, students in this treatment condition plotted their own data. Unlike the other two treatment conditions, students in the SC-SSA group selected their own reading activities. At the onset of the study the teachers used experimenter-prepared materials to describe eight of the activities to the students. At this time, the SC-SSA students selected two reading activities that they believed would best help them learn to read better. Then, as the data utilization rules were applied to the student's reading data and a change in the instructional plan was warranted, the student selected a new strategy

from a set of four that the teacher presented to the student in the same fashion as described above. The new reading activity replaced one of the two previously implemented.

Given the nine week length of the study, the three times per week schedule of student reading measurement, and the data utilization rules, a range of two to six reading activities was used with the students in any of the three treatment conditions. The specific activities were: (1) Newspaper Hunt; (2) Oral Reading and Error Practice; (3) Illustrating a Story; (4) Language Experience; (5) Making Clay Words; (6) Direct Practice with Prompting; (7) Simplifying the Task; (8) Reading and Reacting; (9) Choral Reading; (10) Comprehension Questions; (11) Tape Recorded Stories; and (12) Silent Reading and Retelling the Passage.

Each activity included in the study had a rating of high or low structure based on scores yielded on the Structure of Instruction Rating Scale (cf. King, Deno, Mirkin, & Wesson, 1983; Skiba, Wesson, & Deno, 1982). Each set of options was arranged to include two high-structure activities and two low-structure activities. Therefore, it was probable that an equal number of high and low structured activities would be selected by chance.

Student Achievement Measures

Two types of student achievement data were collected. First, the median numbers of words read aloud correctly from three third grade oral reading passages from the Ginn 720 Reading Series were collected as both pretest and posttest data. These simple measures were used because of their demonstrated reliability, validity, and sensitivity

to change (Deno, Mirkin, & Chiang, 1982; Marston, Lowry, Deno, & Mirkin, 1981). These simple measures were more likely to detect subtle changes in student reading performance than would a commercial test; this characteristic was important because of the short duration of the study (9 weeks).

The second academic measure was the scores from the Comprehension subtest of the Gates MacGinitie Reading Tests, Level B, 1978 edition. Level B, designed for second grade, was used because of the estimated second grade reading ability of the students in the study. Use of a higher level might have produced a floor effect on the scores. The Comprehension subtest begins with simple sentences and progresses to longer passages involving more complex relationships. Each of the 40 passages is accompanied by four pictures from which the student must choose the picture that illustrates the passage or answers a question about the passage. The dependent data were the number of items answered correctly.

Results

Matched pairs *t* tests were used to compare pre and post scores for each of the treatment groups. Results indicated that each treatment group made significant gains on some of the dependent measures. The TC-TSA group significantly improved on passages 1 and 3, and the SC-TSA group showed significant improvement on passages 1 and 2. Only the SC-SSA group showed significant improvement on all three passages. No group showed significant improvement on the Gates MacGinitie Comprehension subtest. However, the TC-TSA and SC-TSA group responded correctly to fewer items on the posttest than on the

pretest. Only the SC-SSA showed improvement on the comprehension test. (See Table 1.) Overall, the SC-SSA group showed more improvement than the other groups on each measure. (See Figure 6.)

Insert Table 1 and Figure 6 about here

Discussion

Student Charting

Student charting did not yield any significant effects. There are several possible explanations for the lack of significant results. First, the length of treatment may have been too short to provide enough time for a fairly unobtrusive procedure, such as self charting, to produce any effects, although nine weeks is a long time compared to duration of prior studies in this area. Another possible reason for the lack of effects might be the fairly constrained procedures described in the self-charting directions. Students were limited to placing a data point on the intersection of two lines and were not allowed to be more creative with self charting. In past studies, students were given more flexibility (Paquin, 1978) and therefore may have had a heightened sense of control over or input into the situation. A more creative, and loosely defined procedure may have yielded different results. Last, student charting may simply be an ineffective treatment. The procedure used in this study did not take more than three minutes per week to implement. It may not be possible to generate effects using any treatment that requires such a small time commitment.

At this time, the evidence does not seem to suggest that self charting is a sure fire procedure. However, as was mentioned, it is also a fairly unobtrusive and time efficient procedure (Fuchs, Wesson, Tindal, Mirkin, & Deno, 1981), which may facilitate some positive results especially with respect to student satisfaction. In other words, since the procedure requires little teacher effort, saves teacher time, and has no deleterious effects, it may be worth using even if it has no effects on student achievement. The fact that self-charting may help to increase the student's responsibility for learning may be a significant enough outcome to justify the use of this procedure.

Student Selection of Instructional Activities

Student selection of instructional activities seems to have a positive effect on student achievement. This finding is especially interesting given the fact that students tended to select less structured activities (Wesson, 1983). Therefore, it is possible that the opportunity to take part in decision making is motivating. Perhaps even greater improvement in achievement would be manifest had the instructional options all been high structured activities. Clearly, a study investigating this possibility would be a logical follow-up to the present experiment.

The finding that student selection of instructional activities has a positive effect on achievement has an important implication for the formative evaluation system described in the manual, Procedures to Develop and Monitor Progress on IEP Goals (Mirkin, Deno, Fuchs, Wesson, Tindal, Marston, & Kuehnle, 1981). A major skill required of

teachers using this formative evaluation system is to make substantial and meaningful changes in the student's instructional program when the data indicate changes are necessary. Making the changes on time and making substantial changes are tasks that teachers have a great deal of difficulty mastering (King, et al., 1983; Skiba, et al., 1982). Therefore, one way to make changes that are likely to have beneficial results is to allow the student to choose among several options. Using this procedure, teachers have a greater likelihood of making changes in instructional plans that will result in greater student achievement. Potentially, an optimal situation may be one in which the student is allowed to choose among instructional activities that are highly structured in terms of direct instruction, feedback, and a high percentage of correct answers.

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Footnote

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Table 1

Matched Pairs T-test Results for each Treatment Condition

Treatment	Pretest $\bar{X}$	S.D.	Posttest $\bar{X}$	S.D.	Difference	P value
Passage 1						
TC-TSA	51.571	25.1	58.500	30.5	+6.929	.026*
SC-TSA	48.077	27.8	56.615	33.5	+8.539	.021*
SC-SSA	48.143	27.3	59.429	35.4	+11.286	.017*
Passage 2						
TC-TSA	54.143	29.1	59.643	32.2	+5.500	.098
SC-TSA	52.692	24.7	60.769	23.8	+8.077	.024*
SC-SSA	52.357	26.5	64.571	36.9	+12.214	.007**
Passage 3						
TC-TSA	39.714	18.7	45.071	22.3	+5.357	.054*
SC-TSA	38.462	20.4	43.385	21.9	+4.923	.093
SC-SSA	41.286	18.2	52.071	33.5	+10.786	.057*
Gates MacGinitie						
TC-TSA	25.429	7.9	23.286	8.5	-2.143	.143
SC-TSA	25.357	6.8	23.714	6.3	-1.643	.290
SC-SSA	24.857	8.0	26.071	6.9	+1.214	.381

* Significant at the .05 level
**Significant at the .01 level

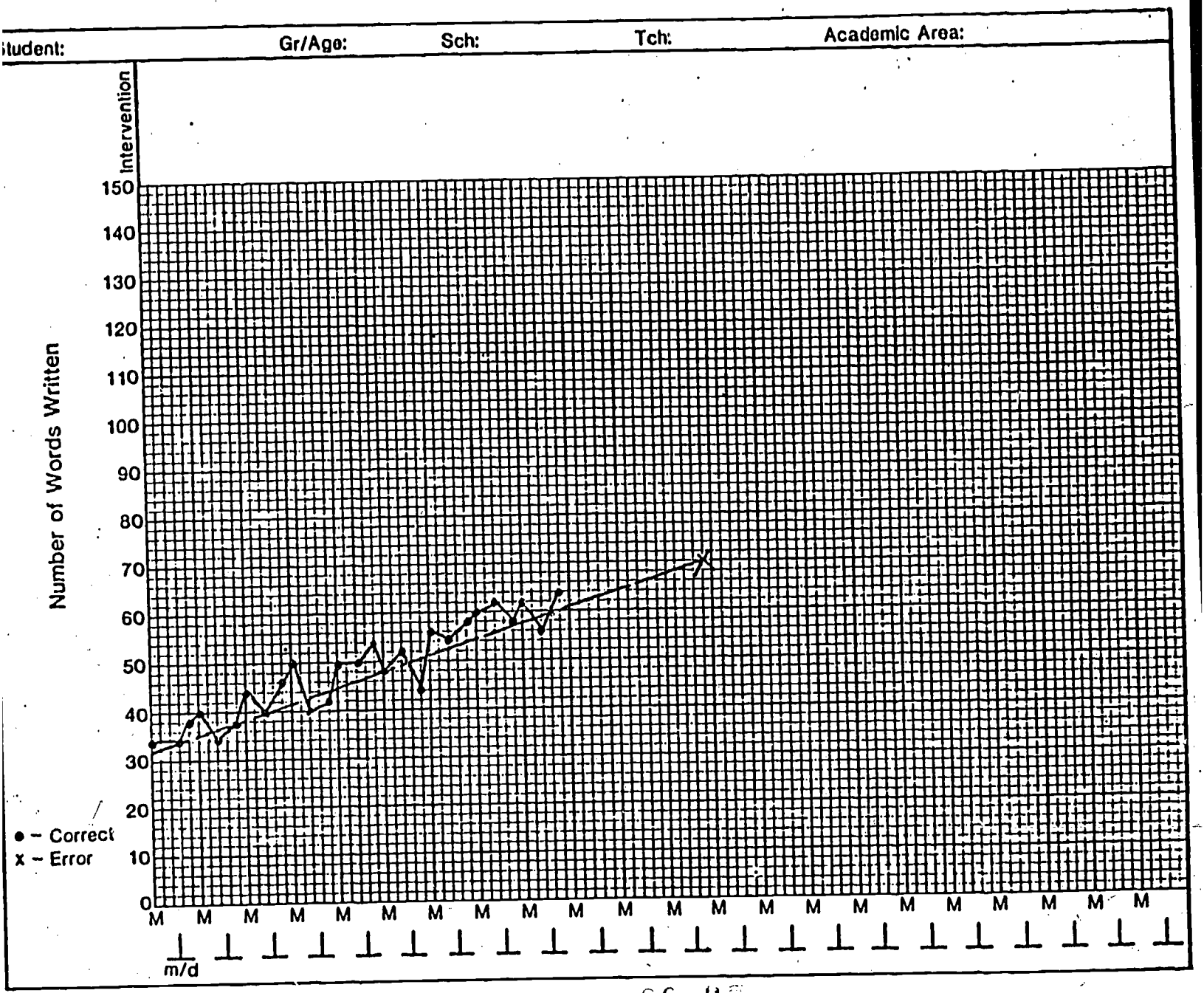


Figure 1: Illustration of performance measurement.

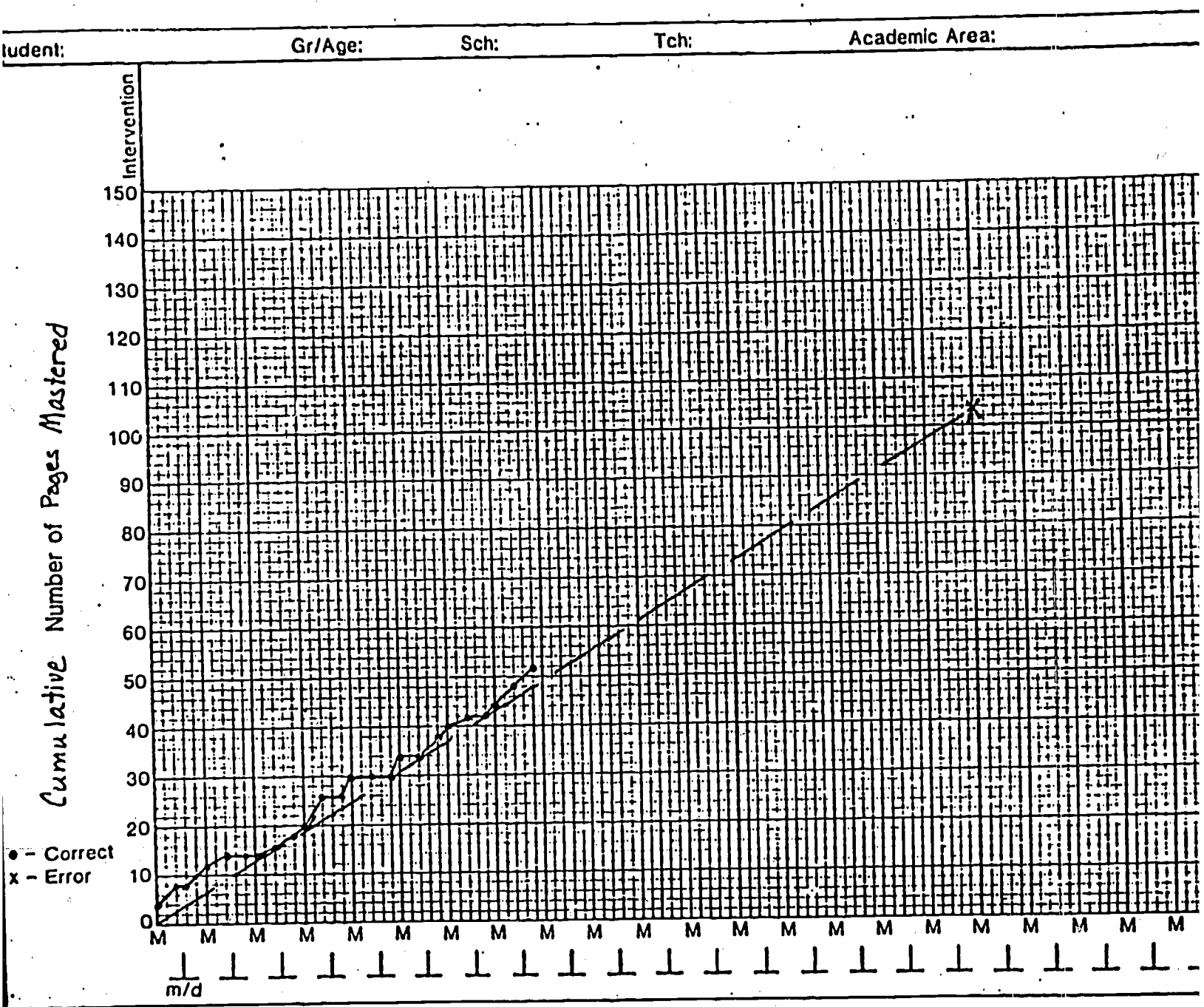


Figure 2: Illustration of mastery measurement.

	Condition	Behavior	Criteria
LRG:	In _____ (total # weeks) weeks, when presented with stories from Level _____ (#), _____ (reading series),	student will read aloud	at the rate of 50 wpm or better 5 or fewer errors.

Figure 3. Format for Long-Range Goal: Reading

Performance Charting: Reading

CONDITION	BEHAVIOR	CRITERIA
Each successive week, when presented with a random selection from_____ (level # from current instructional level - same as LRG) of_____ (reading series)	student will read aloud	at an average increase of _____ (70 or 50 wpm - actual performance) total # weeks remaining in school year.

Mastery Charting: Reading

CONDITION	BEHAVIOR	CRITERIA
Each week, when presented with successive stories from _____ (Level #s from current instructional level to annual goal level)	student will progress	at the rate of _____ stories per week maintaining the mastery criteria of at least 50 wpm (gr. 1 & 2) with 5 or fewer errors and 70 wpm (gr. 3-6) with 7 or fewer errors

Figure 4. Performance and Mastery Charting Short Term Objectives for Reading.

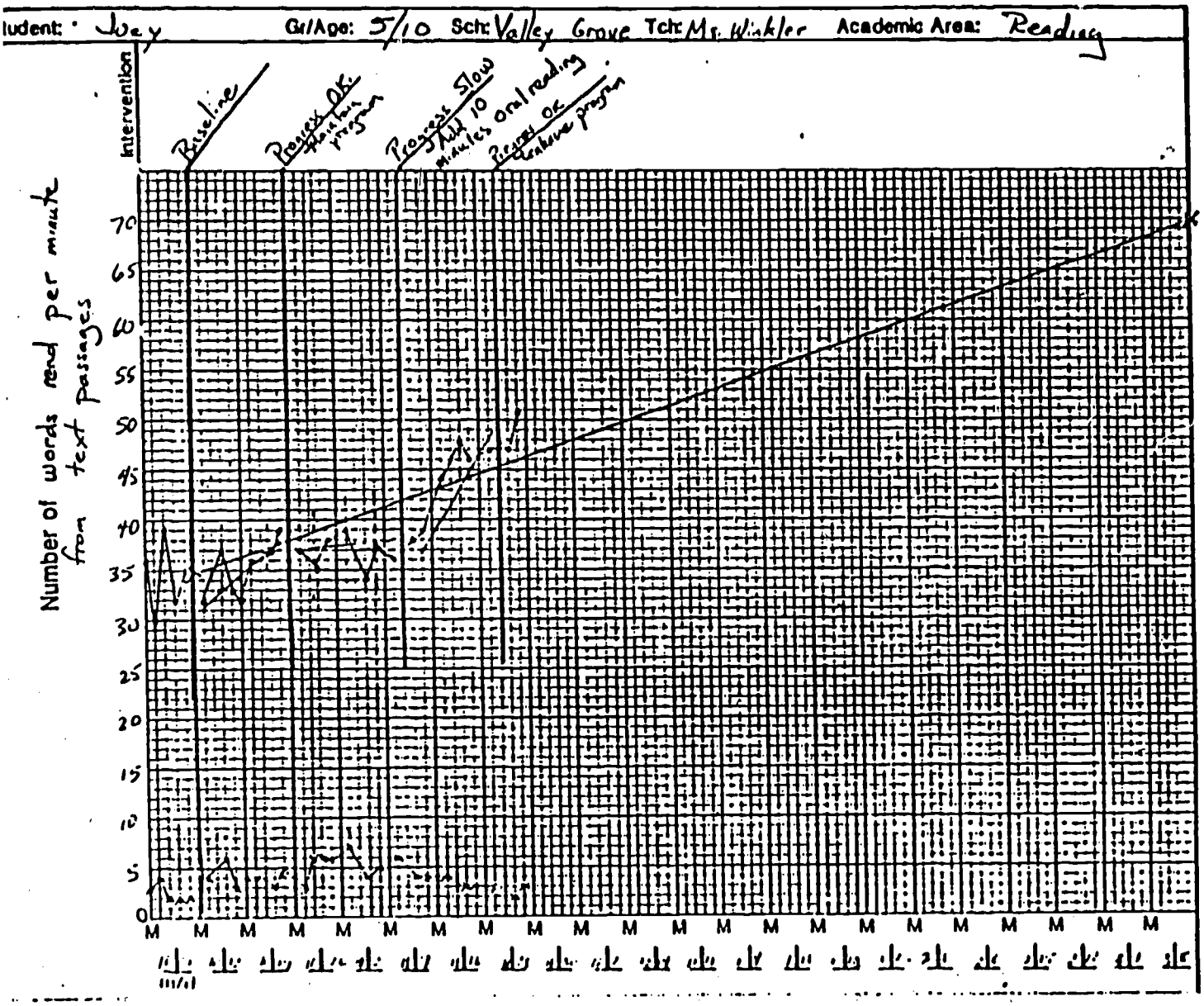
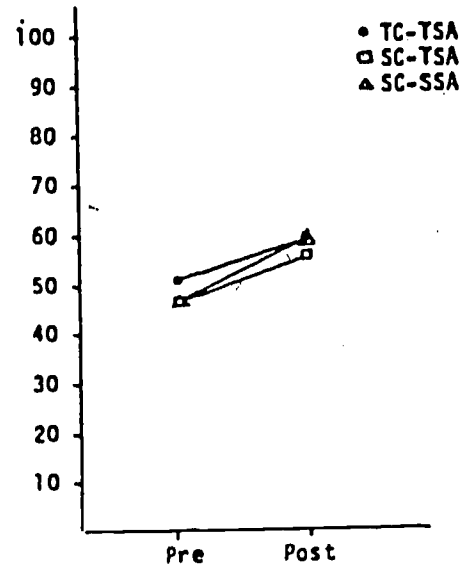
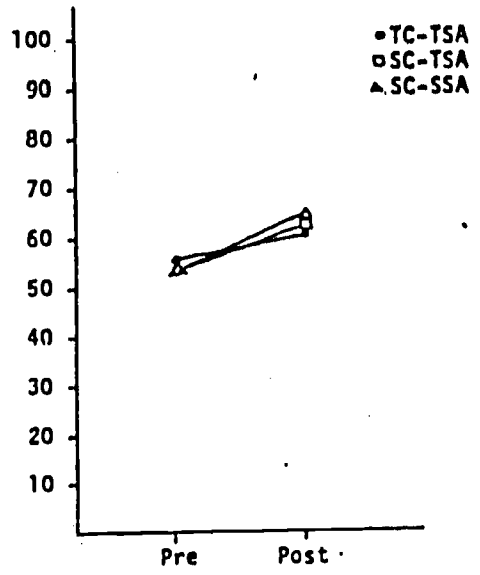


Figure 5. Using the split-middle technique to monitor student progress.

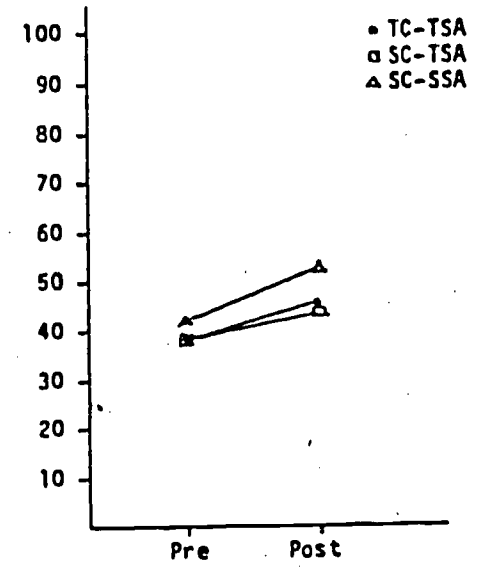
Passage 1 - Mean Number of Words Read Correctly



Passage 2 - Mean Number of Words Read Correctly



Passage 3 - Mean Number of Words Read Correctly



Gates-MacGinitie Comprehension Test-- Number of Items Correct Out of 40

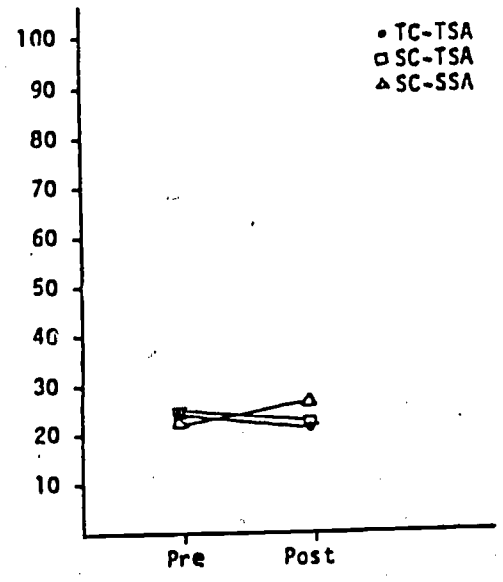


Figure 6. Graphs depicting progress made by students in each treatment condition for each passage and the Gates-MacGinitie Comprehension Subtest.

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