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Journal of Precision Teaching

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EDITORIAL POLICY

The Journal of Precision Teaching is a multi-disciplinary journal dedicated to a science of human behavior which includes direct, continuous and standard measurement. This measurement is composed of standard units of behavior—frequencies—which are collected and recorded on a standard scale—the Standard Behavior (Celeration) Chart. Collections of frequencies are summarized on this Chart using a standard measure of behavior change—celeration. Frequencies and celerations displayed on the Standard Behavior (Celeration) Chart form the basis for Chart-based decision-making and for evaluating the effects of independent variables.

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Materials submitted for publication should meet the following criteria: (1) be written in plain English, (2) contain a narrative that is brief, to the point and easy to read, (3) use the Journal of Precision Teaching Standard Glossary and Charting Conventions, (4) contain data displayed on the Standard Behavior Chart that justify conclusions made, (5) be submitted in quadruplicate to the editor, and (6) include one set of original charts or hand-drawn copies. Each formal manuscript will be reviewed by one consulting editor and two reviewers, two of whom must approve it prior to publication.

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As part of its goal to disseminate research, the University Affiliated Facility for Developmental Disabilities (UAF) at the University of Missouri in Kansas City, under the direction of Carl Calkins, assisted with the production of this Journal.
SOME COMPARISONS BETWEEN SEE/WRITEx AND SEE/TYPCATHMETIC TIMINGS

Dependent Variables

The frequencies of ten pinpoints were recorded. Think/write (1) and think/type (2) digits in sequence. See/write (3) and see/type (4) digits, random order. See/write and see/type addition facts (5 & 6), subtraction facts (7 & 8) and multiplication facts (9 & 10).

Independent Variables

Students were matched on previous arithmetic performance and then randomly assigned to one of two groups. See procedures for details. Group I took only traditional see/write and think/write timings. Group II did two sets of timings each day. They did the traditional timings just as Group I did, and they also took a set of timings on the microcomputer, the think/type and see/type learning channel set timings. Thus, two conditions serve as independent variables—the output learning channel (write or type) and the number of daily timings (five or ten).

Apparatus and Materials

See/type timings were done on four Atari 800 microcomputers. Three computer programs presented random samples of addition, subtraction and multiplication fact problems each day. Each program signed the students on, timed their performance (1 minute), calculated and displayed frequency correct and incorrect in the lower right corner of the screen, and saved the data from each timing on a 5-1/4 inch floppy diskette. See/write math fact timings were done using 8-1/2/ x 11 inch math fact probes oriented horizontally. Addition facts included sums to 18, subtraction probes had differences to 9 and multiplication sheets included facts through 9 x 9. Problems on the paper probes were arranged in random order daily through the use of different sheets and different starting points.

Procedures

Students were matched according to previous arithmetic performance frequencies on see/write timings, without regard for age, sex or type of conduct problem. The highest of each student's last five consecutive timings was recorded for addition, subtraction and multiplication facts. The total of these three frequencies was used as the child's performance score. Students were then paired by matching these performance scores. One of each pair was assigned randomly to either Group I (see/write only) or Group II (both see/write and see/type).

The procedures listed below were used to gather the data, on a daily basis, over a period of four
consecutive weeks.

a) Each Group I student (N=11) took five
math timings a day (think/write digits in
sequence, see/write digits random and
see/write addition, subtraction and
tool movements and see/write add facts). Group I served as
a check on see/write timings.
b) Each Group II student (N=11) took ten
math timings a day (think/write and
think/type digits in sequence, see/write
and see/type digits random order,
see/write addition, subtraction and
multiplication facts, and see/type
addition, subtraction and multiplication
facts). Group II makes it possible to
compare see/write and see/type data on
the same students.
c) All see/write and think/write timings
were done in the regular classroom.
d) All see/write and think/type timings were
done on Atari microcomputers. Students
left their classroom to take these
timings.
e) There were no practice timings on either
write or type probes.
f) See/write probes started on a new line
of the probe sheet each day, to
approximate the random order of
presentation of the computer-administered
probes.
g) During the last week all students
checked and charted their see/write
frequencies. The classroom teachers had
not permitted student checking and
charting during the first three weeks of
the study. See/type timings included a
presentation of the frequency correct and
incorrect in the lower right corner of
the screen within two seconds of the end
of the timing.

The data presented are based on the median
score for each student, on each probe, for the
last week of data. All but one child achieved
their best performances during the last week.
Celerations are not included because some of the
frequencies from the first two weeks were not
saved on diskette properly.

Results

Chart 1 presents the data on a summary chart.
It includes the ranges of correct frequencies and
the group medians for Groups I and II on each of
the five skills (2 tool movements and 3
arithmetic fact pinpoints). Group I data
(see/write timings only) are charted using single
vertical marks. Group II data are charted using
double vertical marks.

Random Assignment Results

A brief study of Chart 1 shows the results of
the matching and random assignment procedure
described above. The two groups are functioning
very much alike on the two tool movements and
on see/write add facts. However, Group I is
functioning above Group II on subtraction and
multiplication facts. The medians for Group I
for subtraction and multiplication are X1.4 and
X1.6 higher than Group II. An explanation for
these differences is not apparent.

Tool Movement Comparisons

The students found it quicker to think/write
digits in sequence than to think/write digits in
sequence. During the four weeks the median
think/type performance was X1.8 faster than the
median think/write performance. However, it
was X1.8 quicker to see/write random digits than
to see/type random digits. This difference might
be smaller on computer keyboards which have a
calculator style keypad for entering digits.
Additional data are needed on this question.

Arithmetic Fact Comparisons

The comparisons of interest here are within
Group II, the group that did both see/write and
see/type math fact timings. The median
see/write performance is consistently more rapid.
The frequency multipliers (see/write frequency
correct divided by see/type frequency correct)
are: addition X1.2; subtraction X1.2 and
multiplication X1.3.

Comparisons Between Tool Movements
and Arithmetic Facts

Again, there are within group comparisons.
Chart 1 shows that for Group I, the median
see/write tool movement frequency ranged from
X1.4 to X2.1 above the median see/write
arithmetic fact frequency. For Group II, the
median see/write tool movement frequency ranged
from X2.3 to X2.5 above the median see/write
arithmetic fact frequency.

For Group II, the median see/type tool movement
frequency was X1.6 above all three median
see/type arithmetic fact frequencies. Group II
performed see/type arithmetic facts considerably
closer to their see/type tool movement
frequencies. This may be because these tool
movement frequencies are relatively low. But it
is not obvious that it is easier to "approach" a
low tool movement frequency than a high one.

Discussion and Conclusions

The elementary school students in this study had
no formal training with microcomputers. Most of
count per minute

Think/write digits

Think/type digits

See/write digits

See/type digits

See/write Add Facts

See/type Add Facts

See/write Subtract Facts

See/type Subtract Facts

See/write Multiply Facts

See/type Multiply Facts

Chart I. Ranges of Correct Frequencies and Medians for Groups I and II on Five Skills

22 students

digits

Williams, William D., Sakowitz, Susan, and Nancearrow, Elizabeth.
them did have about 40 days of experience playing games on the Atari 800 microcomputer. Twenty days of daily one minute timings on basic addition, subtraction and multiplication facts produced the results presented above.

At the end of this experience most of the students were not doing as well on microcomputer-administered, see/type, timings as they were on teacher-administered, see/write, timings. However Group II, the only group doing both see/write and see/type timings, showed only a slight advantage in frequency of see/write over see/type. Explicit keyboard training and a longer or more intensive experience with the microcomputer may overcome the advantage of the see/write learning channel set. Accuracy results were not presented because accuracy was uniformly high, fewer than 3 or 4 errors per minute, for both see/write and see/type. If there was an accuracy advantage, it was a small one for see/type timings.

The data on tool movements and math fact timings are not easy to interpret without indulging in speculation. They are included here primarily as a contribution to an evolving data-base in this relatively new area of Precision Teaching.

Much research is needed before we can determine which educational contingencies are best managed by microcomputer. Certainly the microcomputer has imposing credentials. If it can teach skills effectively, teachers may be able to concentrate on more advanced aspects of skill measurement and development. The Atari 800 is clearly capable of presenting math drill and practice lessons at rates which will not impose machine ceilings on fluency for human learners. All of the popular microcomputers are capable of being programmed to calculate frequencies and store them in a file on tape or diskette. The Atari is capable of presenting the child's learning on semi-log charts done in four colors, including learning lines, aim stars, record floors and the usual features of the Standard Celeration Charts.

We also need to start exploring the use of programs that apply data-decision rules to frequencies stored in the student's learning file. It seems likely that in the near future this application of decision rule technology will signal the learner and teacher that a change is needed before additional time is spent on an ineffective procedure. The potential of the floppy diskette for quick and semi-permanent storage of student's learning frequencies may be a substantial contribution to Precision Teaching. Floppy diskettes have great potential for making it possible to share and analyze the huge amount of data generated by precision learners and teachers.

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THE RELATIONSHIP OF FREQUENCY TO SUBSEQUENT SKILL ACQUISITION

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Pensacola Junior College

Cecil D. Merger
University of Florida

William H. Evans
University of West Florida

The issue of skill proficiency is perhaps the most important issue in education today. It involves the evaluation of students in elementary school through college, and is of such great concern that laws have been enacted to ensure that students are proficient in certain skills.

Teachers must make decisions daily concerning when to advance a student from one skill to the next. In the past, a time criterion was sometimes used. For example, when working on multiplication facts, a student might spend one week practicing his two-times table, then go on to the three-times table the following week. Individual differences were ignored with this method.

With the advent of Precision Teaching, specification of precise personalized aims for children began to emerge in classrooms. A well-specified aim includes a definition of pupil response, conditions under which that response should occur, and criteria for acceptable performance (Haring & Bateman, 1977). Criteria for acceptable performance and advancement to the next skill, that is, proficiency criteria have often been set in terms of frequency correct and incorrect.

Some disagreement exists about what constitutes proficiency (Haring & Gentry, 1976). A review of the literature suggests that research has not conclusively determined specific optimum proficiency criteria for academic skills. Different guidelines are available to assist teachers in determining when to advance children, but there is little specific research or agreement as to which guideline to use. One
way to establish proficiency criteria for a particular skill is to observe progress on the next related skill on a hierarchy of skills. The proficiency level a child attains on a particular skill makes a critical difference to progress on the next skill level (Haughton, 1972).

Specifying relatively high frequency aims appears to be crucial to student competence. However, controlled research is needed to establish when a child has mastered a skill sufficient for adequate performance on subsequent related skills. The objective of this project was to investigate the relationship of different ending frequencies on a particular skill, saying letter sounds, and subsequent ending frequencies on a related skill, saying CVC (consonant-vowel-consonant) trigrams when amount of practice is controlled.

Procedure

The subjects in this investigation were nine learning disabled students in second through fifth grade. All subjects recognized at least ten consonant sounds and were equated on the task of saying CVC trigrams.

Two probe sheets were used in the study. The first sheet included nineteen consonants and the "a" vowel with ten letters in each line (e.g., b, t, a, r, etc.), 80 letters on the entire sheet. The second sheet had ten CVC trigrams on each line (e.g., cat, tag, ham, etc.), all with "a" as the middle vowel, 100 words on the entire sheet.

The study involved three phases (see Figure 1). During the initial phase, an untimed pretest was administered to each subject on the CVC trigram probe. Percentage correct and incorrect were recorded. Each subject was also administered two one-minute timings on the same probe. In addition, a one-minute timing on the letter sound probe was administered.

With one exception, students were randomly assigned into high, medium, and low frequency experimental phases. Subject #1 was assigned to the high frequency experimental phase because his initial high frequency of saying letter sounds exceeded the medium and low frequency criteria used in the study. During the experimental phase, each subject was trained to a different criterion, either a high, medium, or low frequency of saying letter sounds (i.e., 80, 60, or 40 sounds per minute). Three one-minute timings were presented daily. Praise feedback and informational feedback (information concerning incorrect and correct responses) were given upon completion of each timing.

Subjects #1, #4, and #7, assigned to the high frequency experimental group, were presented one-minute timings until a criterion of 80 correct sounds with five or less errors was attained. Once this frequency was obtained it was held constant by using the controlled reader. The same letters used in the letter probe sheet were on a controlled reader filmstrip designed for this study. Subject #1 was the first to reach the criterion of 80 sounds per minute. His frequency was then maintained for eight timings while subjects #4 and #7 worked to achieve the same criterion. During this phase, Subject #1 said a total of 940 consonant sounds. This number was then used as a criterion for all other subjects during the experimental phase. Thus, all nine subjects had the same amount of practice saying letter sounds.

Subjects #2, #5, and #8, assigned to the medium frequency experimental group, were presented one-minute timings until a criterion of 60 correct sounds with five or less errors was attained. Subjects #3, #6, and #9, all in the low frequency experimental group, were presented one-minute timings until a criterion of 40 correct sounds with five or less errors was attained. These frequencies were held constant by using the controlled reader until the total amount of sounds said was equivalent to the 940 consonant sounds said by Subject #1.

During the final phase, an untimed post-test of saying CVC trigrams was administered to each subject. Percentage correct and incorrect was recorded. In addition, fifteen more one-minute timings of saying CVC trigrams were completed with each subject during the final phase.

Results

Growth on the CVC trigrams from the initial to final phase, and growth during the final phase were represented by add-subtract gain scores, frequency multipliers, and accelerations. Frequency multipliers and accelerations are displayed in Charts 1, 2, and 3.

Gain Scores

The median correct scores of the first and last three CVC trigram timings of the final phase were compared within subjects with add-subtract gain scores. The high frequency experimental group had the highest total gain of 58 words while the medium frequency group had the lowest total gain of 30 words.

The median correct scores of the first two CVC timings during the initial phase and the median of the last three CVC timings during the final phase were also compared within subjects with add-subtract gain scores. The high frequency experimental group had the highest gain of 107 words, while the medium frequency group had the lowest total gain of 36 words.
<table>
<thead>
<tr>
<th>Initial Phase</th>
<th>Experimental Phase</th>
<th>Final Phase</th>
</tr>
</thead>
<tbody>
<tr>
<td>CVC trigrams: one untimed pre-test, two one-minute timings. Letter sounds: one one-minute timing.</td>
<td>Letter sounds: three one-minute timings completed daily. High rate maintained with controlled reader until 940 sounds are said.</td>
<td>CVC trigrams: 15 one-minute timings (three daily), one untimed post-test completed first.</td>
</tr>
<tr>
<td><strong>Subjects</strong> #1,#4,#7</td>
<td><strong>Final Phase</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Subjects</strong> #2,#5,#8</td>
<td><strong>Final Phase</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Subjects</strong> #3,#6,#9</td>
<td><strong>Final Phase</strong></td>
<td></td>
</tr>
</tbody>
</table>

Figure 1. Experimental design
Chart 1. Frequency Multipliers for Median Comparisons during the Final Phase

80 letter sounds/minute
Medium Frequency Group
60 letter sounds/minute
High Frequency Group
40 letter sounds/minute
Low Frequency Group

Evans, Susan S.; Mercer, Cecil D.; and Evans, William H. The relationship of frequency to subsequent skill acquisition.

C. Mercer          S. Evans          9 subjects          say CVC trigrams
Alachua Co. Public Schools Gainesville, Florida
The relationship of frequency to subsequent skill acquisition.

Evans, Susan S., Mercer, Cecil D., and Evans, William H.
Percentage correct and incorrect on CVC trigram untimed probes during the initial and final phase were compared within subjects. The highest total gain was 29 points in the high frequency experimental group, while the lowest total gain was 11 points in the low frequency experimental group.

Thus, the high frequency experimental group had the highest total add-subtract gains in all of the measures discussed. Results were divided between the medium and low frequency groups as to which performed the next highest and lowest on the add-subtract gain measures.

Frequency Multipliers

Frequency multipliers were also used for analysis of the experimental results. This ratio comparison of two frequencies is represented as the multiply-divide distance involved in moving from one frequency to another frequency, and is denoted numerically (Pennypacker, Koenig, & Lindaley, 1972). The median correct scores of the first and last three CVC trigram timings of the final phase were used to determine a frequency multiplier within subjects. The median correct score of the CVC timings during the initial phase and the median correct score of the last three CVC timings during the final phase were also used to determine a frequency multiplier for each subject.

Displayed in Chart 1 are the frequency multipliers obtained from the final phase data. An examination of these data indicate little difference between the low, medium, and high frequency groups. Frequency multipliers obtained from initial and final phase data are displayed in Chart 2. An examination of these data indicates that the most growth occurred in the group required to say consonant sounds at 80 sounds per minute.

Celerations

The quarter-intersect method was used to determine celerations of the CVC trigram data of each subject during the final phase. A visual display of final phase celerations is provided in Chart 3 starting at the median of the first three timings of the final phase for each subject. These data indicate little difference between experimental groups.

Discussion

Subjects in the high frequency group showed the greatest growth in the number of CVC trigrams said. This pattern was noted when comparing the add-subtract gain scores obtained from initial to final phases and during the final phase. A difference in proportional growth in the high frequency group was also noted when using frequency multipliers to analyze the data from the initial to final phases.

However, the frequency multipliers and celerations obtained during the final phase indicated little difference between the groups. As a result, a relationship between frequency of saying letter sounds and growth during the subsequent task of saying CVC trigrams was not clearly demonstrated.

Thus, a need still exists to determine an optimum or critical frequency for this specific prerequisite skill. Effects of training to frequencies of saying sounds above 80 sounds per minute on the subsequent acquisition of saying CVC trigrams needs to be examined. In addition, the relationship of other academic skills and subsequent performance on related academic skills is also a needed area of research. When these optimum aims are established, no more time than necessary will be spent teaching a particular skill.

REFERENCES


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Chart-sharing

COUNTING FETAL MOVEMENT

Abigail B. Calkin
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While I started counting fetal movement prior to the publication of any research articles on the topic, it is important to note what has since been done in the field. According to Dean (1970), fetal distress was indicated by a sudden increase in movement prior to the final decrease. No one had defined "a sudden increase" in frequency terms, however. Edwards and Edwards (1970) published a Standard Celeration Chart reporting fetal movement during one pregnancy. Lindsley (1975) shared data on five fetal movement charts charted in 1968 and 1969. The Edwards and Edwards and the Lindsley charts show data collected daily for approximately five months.

In studies done in Wales (Pearson & Weaver, 1976) and in Philadelphia (Liston, Cohen, Mennuti, & Gabbe, 1982) mothers counted movements from 9 a.m. to 9 p.m. The mother counted ten movements and marked the time of the tenth movement. If she had not felt 10 movements by 9 p.m., she was to notify the doctor. Counting began in the 28th week and continued for the remaining three and a half months of pregnancy. This method is known as the Cardiff procedure. The Liston, Cohen, Mennuti, and Gabbe (1982) study supported the previous work done by Pearson and Weaver (1976) and showed that "movement counting is an acceptable and reliable indicator of fetal health" (p. 426).

When Diana Dean (1970) first suggested that I count fetal movement I was fascinated by the idea, fascinated and intrigued enough that I started about a month too soon. This fortuitous mistake did give me an opportunity to specify what I was counting. Initially I termed the sensations "cramps," then feelings, then pleasant feelings, and finally kicks, movements, ripples, and hiccoughs. I decided to count the latter four items based on discussions with Dean (1970) and Honeyman-Colvin (1970).

I used a golf counter to count the fetal movements and the pain. Each time I felt a movement I pushed the knob on the counter and it recorded the movements up to 99, before returning to 00 and beginning again. On a small piece of masking tape attached to the counter, I tallied the hundreds each day. To count the pains I turned the knob of the single digit recorder also located on the face of the counter. I had purchased the counter at a sporting goods store.

A kick was a sudden movement similar to a firm touch to the skin. As the fetus grows these become firmer and stronger. A ripple was a flutter or a series of rapid flutters. Each hiccough was counted separately since they were distinguishable and since a hiccough is a movement of the diaphragm. A hiccough session might last from one to three minutes and produce 50 to 180 movements. Movements included counts of all other events that occurred. Of those the most noticeable was when the fetus turned. Given that a movement has a beginning and an end to it, if I perceived the sensation end, I counted that as one movement even though it might be one of a series of five or six movements in the process of turning.

Since there was no movement for six days during the fourth and fifth weeks of counting, I had a phase before the movement began. (Once movement begins, it is generally believed that if there is no movement felt for 24 hours the fetus is no longer alive.) I began to feel fetal movement during the fifth or sixth week of counting.

The remainder of the chart may be analyzed into four parts through trend analysis. The first trend was three weeks long and showed an acceleration of x7 from a frequency of zero to about 100. This was the fourth month of pregnancy. The second trend was the following twelve weeks (months five, six, and seven) and showed a maintenance of frequency. The range was from 80 movements per day to 426 with a median of 210 per day. The third trend was during the eighth month and showed an increase in the frequency range from about 270 to a high of 746 movements per day. This month had a median of 380 per day and showed no change in acceleration. The first two weeks of the ninth month showed a deceleration and a leveling off with a median of 240 movements per day.

On August 24th, my obstetrician informed me the fetus had an irregular heartbeat. Since there was no record of that occurring in a fetus, he
Chart 1. Seth's Fetal Movements

- Cramps
- Feeling
- Pleasant Feelings
  - a- kick
  - b- movement
  - c- ripple
  - d- hiccup

SUCCESSIVE CALENDAR DAYS

DEPOSITOR: Seth McKenzie Koch
SUPERVISOR: D. Dean
ADVISER: D. Dean
MANAGER: A. Calkin
BEHAVIOR: D. Dean
ADMINISTRATION: A. Calkin
NOTE: *born: 25 Aug 70

* makes fetal movements
Chart 2. Seth's Fetal Movements

- a - kick
- b - movement
- c - ripple
- d - hiccup

- DROPPED -
Chart 3. Abigail's Painful Feelings

Painful Feelings

- organ pressure
- cramps

SUCCESSIVE CALENDAR DAYS

COUNT PER MINUTE

0 10 20 30 40 50 60 70 80 90 100 110 120 130 140

DEPOSITOR
SUPERVISOR
D. Dean
D. Dean
A. Calkin
A. Calkin
BEHAVIOR
BEHAVIOR
MANAGER
MANAGER
AGE
LABEL
COUNTED

pain/cramps

Calkin, Abigail B. Counting fetal movements.
Chart 4. Abigail's Painful Feelings

Painful Feelings

a- organ pressure
b- cramps
decided a Caesarean was the best idea. The doctors found Seth had no specific cause for the irregularity. Irregular heartbeats are found usually in middle aged adults as a result of one or more of three accesses: caffeine, nicotine, or stress. I did not chart my caffeine or nicotine consumption that summer but do know that I consumed 175mg. to 325mg. of caffeine per day (a cup of coffee contains 80 to 180mg.) (Guthrie, 1979), smoked about one pack of cigarettes per day, and had an unusual amount and intensity of stressful events. I have assumed while I was able to absorb all that without it affecting my pulse rate, the fetus was not able to do likewise. While the irregular heartbeat was not life-threatening to the fetus, the doctors did not know this until after delivery. In comparing Seth's chart to Pearson and Weaver's (1976) fetal distress charts, his fetal movement was still normal and showed no sign of distress.

In addition to counting fetal movement I also counted painful or cramping sensations. These included organ pressure, pain, cramps, and contractions. It is impossible to say if the increase in the last two weeks would have continued during the remainder of a full term pregnancy. It is possible that these counts coupled with the decrease of fetal movement could give some very positive and helpful indications of imminent delivery and/or fetal distress.

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HOW PRECISION TEACHING DECELERATED INAPPROPRIATE PHYSICAL CONTACTS

Kathleen Elrick
Alice Dye Maechten
Albuquerque Public Schools

I'd like to share the results of a Precision Teaching project conducted in a classroom for severely and profoundly handicapped children in a public elementary school. Melissa, a student in the classroom, was a very appealing child, but she was stubborn and somewhat unpredictable. She seemed to enjoy observing other students and their reactions to her behavior. The more her behavior disrupted the class, the happier she appeared to be. The main purpose of this project was to reduce her most disruptive behavior. I'll also report results obtained in a follow-up study nearly a year after the original intervention.

Melissa was a nine year old Down's Syndrome child in the severely retarded range. She disrupted most group activities with various inappropriate behaviors. The target behavior was labeled "inappropriate physical contacts." This broad target included hitting, kicking, pushing, poking, and pulling at other students or their clothing. These behaviors occurred most often during group activities, so intervention occurred and data were gathered at this time.

I used a counter to record each occurrence of the target behavior during 30 minutes of group activities daily. Before intervention data were gathered for a total of eight days. The three days of the first week showed a much lower frequency than was expected. It was the consensus of all who worked with Melissa that the second week's data were more typical of Melissa's actual behavior. For that reason the median frequency of that second week of the before intervention phase (1.4 per minute) was used in all comparison calculations.

I discussed the target behavior with the classroom teacher, who was serving as my advisor, and we agreed that the behavior was occurring at an unacceptable frequency. We then decided on an intervention procedure. Immediately after every inappropriate physical contact Melissa was removed from the group and given a brief explanation such as, "No, don't kick." She was kept away from the group for 30 seconds while I held her wrists so that she could not engage in any self-consequating activities. When she behaved appropriately in the group she received the natural consequences of group participation. She was also given verbal praise contingent on every five to ten minutes of appropriate behavior. As shown in Chart 1, this
Chart 1. Melissa's Chart

SUCCESSIVE CALENDAR DAYS

<table>
<thead>
<tr>
<th>SUPERVISOR</th>
<th>Adviser</th>
<th>Elrick</th>
<th>Manager</th>
<th>Melissa</th>
<th>Age</th>
<th>Makes inappropriate physical contacts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Albuquerque</td>
<td>Public Schools</td>
<td>Albuquerque, New Mexico</td>
<td></td>
<td></td>
<td>9</td>
<td>Counted</td>
</tr>
</tbody>
</table>

Before Intervention

Intervention

Return to Before Intervention

Approximately 9 months later
procedure produced rapid deceleration of the target behavior. By the end of the two weeks of intervention the behavior had decelerated to one occurrence in 30 minutes. This was a frequency divide of 40.

After the two week intervention phase we returned to the before intervention condition. I observed Melissa during the same periods, but I did not intervene. Melissa continued to receive the natural consequence of participating in group activities. The target behavior remained near the counting period floor.

Approximately nine months later I returned to the classroom to observe Melissa for a follow-up period. I counted the inappropriate physical contacts during 30 minutes of group activities daily for one week. During this follow-up phase I did not intervene. The median of 3 inappropriate physical contacts in 30 minutes corresponds with the long term observations of the classroom teacher. When compared with the last week of the before intervention phase, the frequency of inappropriate physical contacts had divided by 15. I was pleased to see Melissa participating and appearing to enjoy the group activities. This new pattern of appropriate behavior was verified by the classroom teacher through anecdotal information and Standard Celeration Chart data for other behaviors in areas such as communication, social skills, and fine motor skills. The teacher further reported that group activities are much more pleasant and beneficial for the class now that Melissa's inappropriate physical contacts are at such a low frequency.

DISCIPLINE IN AN ELEMENTARY SCHOOL

Patricia Flanagan
Morris Hill Elementary School

The purpose of this report is to share data on the frequencies of students sent to the principal for discipline in an elementary school, and to show the effects of school-wide Assertive Discipline on these frequencies.

The Gallup Poll and other surveys rate discipline as the number one problem in the public schools. The data presented in this article may be of interest to educators and parents who are concerned about discipline in the public schools.

Morris Hill Elementary School is located at Fort Riley, Kansas. The students are children of military personnel. The average enrollment is 400 students in grades Kindergarten through sixth.

Chart 1 shows the frequency of students sent to the principal for discipline before and following the adoption of school-wide Assertive Discipline. During the 1980-81 school year, there was no building wide discipline plan and teachers sent students to the principal for discipline at their own discretion. The frequency of students sent to the principal ranged from zero to 20 per week, with a median of five per week.

At the beginning of the 1981-82 school year, the Morris Hill staff were trained to use Canter's Assertive Discipline. Assertive Discipline is an approach where each teacher posts no more than five rules for her/his classroom along with the consequences for both following or not following the rules. Using Assertive Discipline, teachers send students to the principal after a student has broken five classroom rules in one day, or has caused a serious disruption. As shown in Chart 1, following the adoption of Assertive Discipline, the frequency of students sent to the principal ranged from zero to 18 per week, with a median of four per week.

A comparison of the frequencies before and following the adoption of school-wide Assertive Discipline shows the following: the median frequency of students sent to the principal for discipline decreased from five to four per week; the total bounce was similar during both periods (x20 before and x18 following the adoption of Assertive Discipline); the overall celeration for five months before the adoption of Assertive Discipline was x1.4; the overall celeration for nine months following the adoption was x1.1.

The frequencies, bounce and celeration shared here represent only one elementary school. It would be interesting to compare these measures with those from other schools and with the effects of other discipline strategies.

Dr. Patricia Flanagan is the principal of Morris Hill Elementary School, Geary County USD 475, Junction City, KS 66441.
Chart 1. Students sent to the Principal for Discipline
NOTES FROM THE EDITOR

Patrick McGreevy

Welcome to Volume IV, Number 2. This issue contains information on a variety of pinpoints (events that are counted and charted). A special welcome goes out to our new subscribers, as well as a special thanks to our continuing subscribers who remembered to renew their subscriptions early.

We need subscribers, manuscripts and Chart-sharing articles. Please send your material; one of our reviewers will help you get it in publishable "shape." We would appreciate it if you would introduce the Journal to a friend (especially a new Precision Teacher). If you do not have subscription blanks, just drop us a note telling us what volumes you want along with a check.

Two new columns will appear in the next issue. One will address day-to-day issues of classroom teachers and one will instruct new Precision Teachers on various aspects of the Chart and Precision Teaching. How about some new subscribers for the next issue?!

CURRICULUM

Marie Eaton

One of the most frequent complaints about Precision Teaching is that it "takes too much time." It is true that Precision Teaching does take extra time, if you continue to run your classroom exactly as you always have and add PT to the list of things to be done each day. Efficient Precision Teachers learn quite quickly, however, that with a little organizational change, the time requirements for PT are lessened and in addition, their pupils become more independent learners. Sheila Fox and I have collected a list of organizational ideas from our own experience, from teachers we have observed and from the teacher trainers in Great Falls. We compiled them in the following categories: materials, timings, correction, charting and decision making. If you have other ideas that we have not mentioned, please send them along and I'll include them in a future column.

I. ORGANIZE MATERIALS

A. Prepare the probe materials or practice sheets.

- Define the skill to be measured and find or prepare, then arrange the worksheet(s). Sometimes this will mean organizing a sequenced set of worksheets (see to write digits through a sequence of advancing skills) and other times it will only mean defining the sequence (think to count numbers in order 1-50, 1-100, 100-200).

Make sure you:
1. Probe what you are teaching.
2. Probe tool skills to ensure fastest possible growth.
3. Use alternate forms or different starting place to minimize a memorized order of responses.
4. Probe at largest curriculum step at which the student can adequately learn.
5. Provide sufficient opportunities to respond (the aim X1.5 is a good guideline).

B. Choose an organizational system for written worksheets. Options include:
   1. Keep all probes in file folders arranged in sequence in a specific location in the classroom and are passed out by the teacher or students, as necessary;
   2. Probes placed in folders kept at the pupil's desk and sorted daily/weekly;
   3. Probes placed in labeled pigeon holes where pupils may go and pick up their own.

II. ORGANIZE TIMINGS

A. As a group

   1. Everybody takes a sample at the same time when the teacher says "begin," but the worksheets in front of the children vary with individual needs.

   2. Use the "exponential" system. Teacher times first child, then sends first child to time second while teacher times third, etc.

   3. Use a prerecorded tape, beeper or music sample to signal the beginning and end of timing.

B. As individuals

   1. Children may go to the tape recorder at a learning station and take a sample from a pre-recorded series of 1' samples as they complete other
assignments through the day;
2. Each child has a partner and is responsible for being sure that all samples are completed before the day's end;
3. Child raises flag on desk to indicate readiness for timing, then goes on with other work. Teacher times when able.
4. Use volunteers or peer tutors to time.

C. In general
1. Take short timings. For most academic work one minute is adequate.

III. ORGANIZE CORRECTION
A. Self-correct
1. Answers on back of practice sheet
2. Correction key at a correction center
B. Others correct
1. Assign correction partners
2. Use volunteers, aides, older pupils

IV. ORGANIZE CHARTING
A. Self Charting
Have pupils chart their own counts and have them checked by the teacher or a "chart monitor''
B. Other Charting
1. Assign charting "partners''
2. Use tutors from an older class to time, count and chart. (If this procedure is followed, tutors should be trained before they begin, preferably with a criterion test as the deciding element that allows a tutor to begin work.)
3. Use retired people or adult volunteers as chart monitors.

V. ORGANIZE DECISION MAKING
A. Self Decisions
Train pupils to alert you when "learning pictures'' indicate trouble;
B. Others Decide
1. Scan each chart daily and "red flag'' those that require a six day trend or decision;
2. Have chart monitors alert the teacher to impending changes by placing questionable charts in a special basket or tagging with a red flag;
3. Establish a routine of checking charts on specific days.

COMPUTERS
John Eshleman, Steve Graf, and Bill Wolking

This year's Winter Precision Teaching Conference saw continued evidence that the combination of microcomputers and Precision Teaching is a nicely meshed relationship. To wit:

Bill Wolking presented how he uses Visi-Calc to organize data pertaining to how much learning student teachers produce. This software can be classified in the area of computer-managed instruction (CMI). His software allows for effective monitoring of student-teacher productivity. Various measures of teaching efficiency and effectiveness—a series of measures with names like "Ogs'' and "Lops''—are computed by Visi-Calc. All in all, it was an effective demonstration of the application of already existing software.

In the area of "computer assisted instruction," or "computerized instruction" as John Eshleman prefers (because the machine is actually doing the teaching, not merely "assisting" in it), Bill Wolking and Michele Russ made a presentation. They showed a microcomputer program on the TRS-80 Model III that teaches Precision Teaching technical terms. Their software, moreover, stores learning histories. This latter aspect is a step towards cybernetic computerized instruction—or "self-corrective software.''

Also in the area of computerized instruction the Zero Brothers (Zack and Zeke) were back for a second year in a row. Steve Graf (Zeke) and Jack Auman (Zack) presented an updated and advanced version of their Precision Decisions program. This program—for the Apple II+ computer—teaches data-based decision making from data generated by the Apple (although, once a decision has been made the generated data reflect that there has been a decision made by the user). Importantly, the program brings one to select looking at both correct and error frequencies and to look at a week's worth of data before making a decision. Also importantly, instead of waiting an actual week before making a decision—by which time charting behavior may have extinguished—the decision making responses are compressed into a short period of time.

John Eshleman presented the strategies and
tactics of how he is proceeding with setting up CI software that not only measures the frequency of student responding at the keyboard, but also the celeration (in this case: count/min./5 min.). The idea is to have the machine make a celeration-based decision, and implement a program change if possible. The program is being written on an Apple II+.

Lastly, John Eshleman made a presentation entitled "All the known Precision Teaching references: Building a microcomputer data-base." On a floppy disk for the Apple II+ computer are more than 650 Precision Teaching/Standard Celeration Chart references ranging from 1964 through 1983's conference. This software is an initial effort towards building a computerized data-base. Hopefully, once this data-base gets distributed, our communications with and acknowledgements of others will accelerate.

If you have any Precision Teaching relevant software or know of any, let us know. Also, this may be of interest to readers of the Journal of Precision Teaching: there is a software directory published in every issue of The Behavioral Educator newsletter. To subscribe or find out more information about this related publication you can contact The Behavioral Educator, 504 Allen Hall, West Virginia University, Morgantown, WV 26506.

LETTER TO THE EDITOR

Marie Eaton

Just a note for those who read the article in the Winter 1983 issue on "Using Precision Teaching to Teach Precision Teaching." Sheila Fox and I have increased the frequency for both accuracy and fluency for most of the units. We adjusted the frequencies based on the student's scores from 6 academic quarters. The new frequency are:

<table>
<thead>
<tr>
<th>Unit 1,2,4, 5A,6,7A,8</th>
<th>Accuracy</th>
<th>Fluency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unit 3</td>
<td>20/0</td>
<td>30/0</td>
</tr>
<tr>
<td>Unit 5B</td>
<td>10/0</td>
<td>20/0</td>
</tr>
<tr>
<td>Unit 7B</td>
<td>10/0</td>
<td>15/0</td>
</tr>
</tbody>
</table>

Accelerating Target — a movement the behavior, manager, advisor, or supervisor expects to accelerate; the frequency is symbolized by placing a dot on the Chart.

Accuracy Improvement Multiplier — a measure of change in accuracy over time; acceleration/celeration incorrect.

Accuracy Multiplier — measure of accuracy: frequency correct/frequency incorrect; distance from frequency incorrect to frequency correct; also called the accuracy ratio.

Accuracy Pair — two movements, usually correct and incorrect, charted simultaneously.

Add-subtract Scale — any measurement scale on which adding and subtracting by a constant amount is represented by a constant distance, the "up the left" scale on an equal interval chart.

Advisor — person who advises a manager, usually viewing Charts on a weekly basis.

Behavior Floor — the lowest daily frequency possible for a particular behavior; 1/number of minutes behavior can occur; symbolized by drawing a solid horizontal line on the Chart.

Bounce Around Celeration — up bounce and down bounce combined; the range of deviations of frequencies from the celeration line.

Celeration — basic unit of measurement of behavior change; change in frequency per unit time.

Celeration Aim — the expected celeration for a given movement.

Celeration Line — a best-fit, straight line constructed through seven or more continuous frequencies of a given movement on the Standard Behavior Chart.

Celeration Multiplier (turn up or turn down) — value by which one celeration is multiplied or divided to obtain a second.

Change Day — first day of a phase change; symbolized by drawing a vertical line covering that day line on the Chart.

Counting Period Ceiling — the highest frequency observable under a given counting procedure; symbolized by drawing a dash line on the Chart connecting the Saturday and Monday lines.

Counting Period Floor — the lowest frequency detectable by a given counting procedure; 1/number of minutes spent counting; symbolized by drawing a dash line on the Chart connecting the Tuesday and Thursday lines.

Cycle — distance on the Chart between consecutive powers of 10.


Decelerating Target — a movement the behavior, manager, advisor, or supervisor expects to decelerate; the frequency is symbolized by placing an "xn on the Chart.

Double Improvement Learning Picture — both movements of an accuracy pair with celerations in the expected direction; for example x

Down Bounce — the distance from the celeration line to the frequency farthest below it.

Duration — the amount of time it takes to complete one occurrence of a behavior; 1/number of minutes spent behaving.

Event-following Celeration Line — a celeration line drawn through all frequencies for a given movement just prior to a phase change.

Freehand Method — a method of visually estimating and drawing celeration lines.

Frequency — basic unit of behavioral measurement; the number of movements per unit time.

Frequency Aim — the expected phase-ending frequency for a given movement; symbolized by drawing "A" at the expected frequency on the day the aim was set.

Frequency Line — a horizontal line on the Chart; also called a counting line.

Frequency Multiplier (jump up or jump down) — value by which one frequency is multiplied or divided to obtain a second.

Geometric Mean — the appropriate method for obtaining an average on a multiply-divide scale.

Ignored Day — a day on which the behavior being measured occurs but is not charted.

Latency — the amount of time between the occurrence of a signal and the beginning of a movement; 1/time from signal to start of movement.

Learning — a change in performance per unit time; also called celeration.

Learning Picture — the celeration lines of both movements of an accuracy pair viewed together; for example x

Manager — person who works with the behavior on a daily basis.

Median Celeration — the middle celeration in a celeration distribution; symbolized by drawing a "<" on the Chart.
**Median Frequency** — the middle frequency in a frequency distribution; symbolized by drawing a "<" on the Chart.

**Most Recent Celeration Line** — a celeration line drawn through the last 7-10 frequencies for a given movement.

**Movement** — recorded behavioral event; usually specified in terms of a movement cycle with a beginning, middle and end.

**Multiply-divide Scale** — any measurement scale on which multiplying and dividing by a constant amount is represented by a constant distance; the "up the left" scale on the Standard Behavior Chart.

**No Chance Day** — a day on which the behavior being measured has no chance to occur.

**Overall Celeration Line** — a celeration line drawn through all frequencies for a given movement.

**Performance** — the number of movements per unit time; also called frequency.

**Periodic Celeration Line** — a celeration line drawn through all frequencies for a given movement in a specific time period, such as bi-weekly or monthly.

**Phase Change** — a deliberate alteration made to the behaver's environment in an effort to improve the behavior being measured.

**Quarter-Intersect Method** — a method for computing and constructing celeration lines.

**Recorded Day** — a day on which the behavior being measured has the opportunity to and is recorded.

**Single Improvement Learning Picture** — one movement of an accuracy pair with a celeration in the expected direction; for example $<\cdots$.

**Split-middle Line** — a line drawn parallel to a quarter-intersect celeration line, such that half the data points fall on or above the line and half the data points fall on or below the line.

*Standard Behavior Chart* — a standard, six-cycle semi-logarithmic chart that measures frequency as movements/time and celeration as movements/time/time; Daily, Weekly, Monthly, Yearly and Summary versions are available; also called the Standard Celeration Chart.

**Supervisor** — a person who views the Charts on a monthly basis.

**Total Bounce** — distance from the highest to the lowest frequency; analogous to range of an add-subtract scale.

**Trend-following Celeration Line** — a celeration line drawn through visible trends for a given movement.

**Up Bounce** — distance from the celeration line to the frequency farthest above it.

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**Adapted from Pennypacker, H. S., Koenig, C. H., & Lindsley, O. R. Handbook of the Standard Behavior Chart. Kansas City, Kansas: Precision Media, 1972 (by permission of H. S. Pennypacker).**

*Additions to the Second Revision (October, 1980).
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A. Abstracts should be submitted for possible acceptance into the program in one of two categories:

1) REGULAR SESSION: A 1 1/2 hour topical presentation related to precision teaching.

2) POSTER SESSION (SHAR-A-THON): A mini 20-30 minute presentation related to precision teaching designed to facilitate maximum interaction between presenter(s) and conference attendees. The format will be informal and persons attending will have the opportunity to move from session to session at will.

Poster sessions will run concurrently in a large room. Each assigned space will have a table, chairs for the session presenter(s), and a few chairs for those coming by for the poster session. Because of the arrangement of the facility, no equipment can be provided (i.e., overhead, slide projector, etc.). Presenters may choose to bring their own media, equipment, handouts, etc.

Poster session content should stress classroom application and/or research for practice.

B. Please submit a one to two page abstract of your presentation(s) for either or both of the 2 categories (described above) for which you wish to be considered. The following are suggested content areas:

- Administration
- Mainstreaming
- Computers/Technology
- Parent Intervention
- Curriculum
- Personnel Development
- Decision Making
- Program Evaluation
- Effective Utilization Strategies
- Secondary Education
- Higher Order Skill Development
- Severely Handicapped
- Identification and Classification
- Social Skills
- Inner Behaviors
- Teaching Strategies

Each abstract should be submitted in the following format:

1) Name(s), address(es), phone number(s) of presenter(s).
2) School agency, or university affiliation(s).
3) Category of presentation:
   - Regular Session (1 1/2 hours)
   - Poster Session (20-30 minutes)
4) Content area of presentation.
5) Target audience.
6) Title of presentation.
7) Short Outline (one page maximum, double spaced, including a one sentence objective).
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3. The author(s) should use the Journal of Precision Teaching Standard Glossary and Charting Conventions;
4. The manuscript should include data displayed on the Standard Behavior (Celeration) Chart that justify conclusions made.

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15 Aug 83
Dedicated to Mrs. Irene McGreevy, a very special person, and to the children, who, by sharing their Charts, taught us what we know.