Journal of Precision Teaching

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Editorial Policy

The Journal of Precision Teaching (JPT) is a multidisciplinary journal dedicated to a science of human behavior which includes direct, continuous, and standard measurement. This measurement includes standard, dimensional quantities of behavior, frequency, duration, latency, and interresponse time, which are often referred to as measures of the level of a behavior. Data points representing successive measures of one of these quantities are displayed on a standard scale, the Standard Celeration Chart, across real time. Using this Chart, the change in level across two data points is measured using a standard measure of behavior change, frequency (or other quantity) multiplier, and the trend across seven or more data points is measured using a standard, straight-line measure of behavior change, celeration. These quantities and measures form the basis for Chart-based decision-making and for evaluating the effects of independent variables.

The purpose of the Journal of Precision Teaching is to advance the science of human behavior by accelerating the sharing of scientific and practical information among its readers. To this end, both formal manuscripts and informal, Chart-sharing articles are considered for publication.

Manuscripts submitted for publication should meet the following criteria: (1) contain a narrative that is brief, to the point, and easy to read, (2) use the Journal of Precision Teaching Standard Glossary and Charting Conventions, (3) contain data displayed on the Standard Celeration Chart that justify conclusions made, (4) be submitted in triplicate to the editor, and (5) include one set of original charts or hand-drawn copies. Each manuscript will be reviewed by a precision teacher designated by the editor. If the reviewer recommends publishing the manuscript and changes in the same are required, the reviewer will assist the author with these changes. If the manuscript is published, the reviewer's name will be included after the references section.

Volumes I-VI of the Journal of Precision Teaching were published quarterly. JPT is currently published biannually (twice a year) in April and October. Each volume begins with the April issue. The annual subscription rate is $20.00 to libraries, $16.00 to individuals and agencies, and $12.00 to full-time students. The single copy price is $5.00. Advertising rates are available upon request.

Submissions and subscriptions can be sent to Journal of Precision Teaching, Patrick McGreevy, Editor, P.O. Box 1623, Orlando, FL 32802.

Any article or advertisement is the personal expression and responsibility of the author or the advertiser and does not necessarily carry JPT endorsement.
RESUMING PUBLICATION OF JPT

Publication of the Journal of Precision Teaching was suspended with the conclusion of Volume VI in January, 1986. This suspension was due to a decreasing list of subscribers, few publishable manuscripts, and a lack of funds to defray the costs of printing and mailing. Some new manuscripts and funds have been secured, as well as the assistance of several veteran precision teachers, including Abigail Calkin, Mark Koorland, and Claudia McDade. As a result, the publication of JPT will be reinstated with this issue, which will be designated as Volume VII, No. 1. JPT was formerly a quarterly publication; it will now be published biannually (twice a year).

Patrick McGreevy
Editor

WHERE HAVE ALL THE CLASSROOMS GONE?

Gene Stromberg and Marilyn Chappell

What has happened to classroom applications of Precision Teaching? A review of volumes 1-6 of the Journal of Precision Teaching reveals that not only do charts of individuals outnumber those of entire classrooms (by multiples approaching 30:1 per year), but they are accelerating (by a healthy X2.6 per five years). Classroom charts, which barely exist at all--a total of 7 in 6 years, are decelerating at nearly /2.6 per five years. From these data, we might conclude that Precision Teaching is being utilized as a tool for individual change, but does not have impact on classrooms of children. In this context, I believe that it is valuable to look at a project conducted nearly nine years ago which was designed to explore the efficacy of using Precision Teaching to accelerate the learning of an entire classroom of students at once.

Method

In 1979, as principal, I advised Marilyn Chappell, 2nd grade teacher, how to measure the learning of arithmetic for all 15 children in her class at once. With the expressed aim of allowing each child to learn "at his or her own rate", Marilyn arranged her arithmetic instruction time to include three groups which operated simultaneously. Students were assigned to groups according to social compatibility. Marilyn taught the groups to move from one activity to another at a given signal without her assistance. One group played board games that related to concepts being introduced. Another group worked at learning basic math facts with the aid of flashcards and practice sheets. These first two groups worked without teacher input. In the third group, Marilyn directly instructed students to correct learning opportunities they had made during their daily timings. Marilyn only instructed students on those learning opportunities which the students themselves selected from their daily practice sheets.

Marilyn made her own practice sheets of problems. The practice sheets contained about 50 problems, more than Marilyn expected students to complete in a one minute timing. She did not want students to run out of work to do before time was up. Marilyn distributed the sheets to the entire class, instructing them to do as many problems as they could in the one minute.

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She advised them to skip problems they could not do or to guess an answer if they thought it correct. They were assured that "guessing was o.k.". To encourage students to try problems they might not know, she called errors "learning opportunities". If a student erred, s/he created an opportunity to learn correctly. Students were given an answer sheet so they could correct their own work, or switch papers and correct a friend's. Students were instructed to count their corrects and learning opportunity responses and record them at the top of the practice sheet. Students also dated each practice sheet.

After two days of timings, I came into the class to teach the students how to chart their counts on the Standard Celeration Chart (SCC). Students who caught on quickly were encouraged to assist others who wanted more time. Marilyn assisted some students with charting on the days following my instruction. Every student eventually charted their own results on SCCs which they kept in their notebooks throughout the project.

In the first phase of the project, Marilyn introduced practice sheets which presented number concepts to students as suggested by the sequence of the arithmetic text (referred to as "lock-step" in Chart 1). Students began by adding number facts with addends of +5. This phase lasted two weeks. At the end of the two weeks, Marilyn summarized the student's data by drawing learning pictures of correct and learning opportunity celerations. These learning pictures are displayed in Chart 1.

In phases 2 and 3, Marilyn continued introducing arithmetic to students as suggested in the text. After presenting +5 facts and +6 facts, +5 and +6 facts were presented together. The data from these phases are also summarized in Chart 1. To verify that students were, in fact, learning the +5 and +6 facts and not just memorizing the answers from the order of the practice sheet, Marilyn rearranged the problems on a new practice sheet. This rearrangement was Phase 4.

In phases 1-4 most students were improving their correct responses, but were not learning new material (they made no learning opportunities) (see Chart 1). Marilyn decided not to follow the sequence of presentation suggested in the text. Instead, she created a practice sheet including all concepts the text planned to introduce throughout the year--simple addition and subtraction, addition with carrying, subtraction with borrowing, and single-digit multiplication (referred to as "teach all at once" in Chart 1). The sheet had about 20 examples of each concept. In this phase, students continued, as above, to time, count, record, and chart their daily performance.

Results

Chart 1 describes 2-line learning pictures of all 15 students in the class summarized in stacks. The results of each phase are further summarized in Table 1. Ninety-five percent of all "lock-step" pictures (phases 1-4) were "take-off", with corrects increasing and errors remaining flat at "zero". "Teach all at once" produced 100% "Jaws Crossover" pictures, with errors starting higher than corrects, but corrects ending higher than errors. During "lock-step", the median correct learning was X1.7 per week. During "teach all at once", the median correct learning was X2.0 per week.
Chart 1. Celebrations for Math Instruction

LOCK-STEP

TEACH ALL AT ONCE

G. STROMBERG
SUPERVISOR
GARFIELD ELEMENTARY
OTTAWA, KS

M. CHAPPELL
ADVISER

PERIOD FLOORS

COUNTING PERIOD FLOORS

COUNT PER MINUTE

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

0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75

0 .05 .1 .15 .2 .25 .3 .35 .4 .45 .5 .55 .6 .65 .7 .75 .8 .85 .9 .95 1

+5 +6 +5 and +6 +5, +6

addition facts subtraction facts addition with renaming subtraction with renaming multiplication facts

new order

PERIOD FLOORS
Table 1

The Celeration Range and Median for Each Phase

<table>
<thead>
<tr>
<th>Phase</th>
<th>Celeration Range</th>
<th>Celeration Median</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phase 1</td>
<td>1.7-5.0</td>
<td>1.0</td>
</tr>
<tr>
<td></td>
<td>1.0-1.0</td>
<td></td>
</tr>
<tr>
<td>Phase 2</td>
<td>1.6-2.1</td>
<td>1.4</td>
</tr>
<tr>
<td></td>
<td>2.0-1.0</td>
<td></td>
</tr>
<tr>
<td>Phase 3</td>
<td>1.2-1.7</td>
<td>1.3</td>
</tr>
<tr>
<td></td>
<td>8.0-1.0</td>
<td></td>
</tr>
<tr>
<td>Phase 4</td>
<td>1.3-4.4</td>
<td>1.8</td>
</tr>
<tr>
<td></td>
<td>1.0-1.0</td>
<td></td>
</tr>
<tr>
<td>Phase 5</td>
<td>1.1-4.6</td>
<td>2.0</td>
</tr>
<tr>
<td></td>
<td>8.0-1.6</td>
<td></td>
</tr>
</tbody>
</table>

The median error improvement during "lock-step" was 1.0, while the median error improvement during "teach all at once" was 2.3 per week. Students achieved a level of performance acceptable to the teacher on 3 concepts in 4 weeks with "teach all at once". In "lock-step" instruction, students spent 13 weeks on one concept.

Conclusions and Implications

From the data in this study, the following conclusions can be drawn: (1) A teacher can manage an entire classroom of precision learning; (2) high learning opportunity to correct ratios at the outset can result in high rates of learning (Cf. McGreevy, 1980; Bower & Orgel, 1981; McGreevy, et. al., 1982); (3) compacting curriculum and teaching to errors can result in greater learning than "lock-step" instruction.

These conclusions lead to the following implications: (1) with functioning classroom management, compacted curriculum, daily timings, and charting the data on standard celeration charts, an entire classroom of students can rapidly accelerate their learning; this is probably true in subjects other than math; (2) textbooks may slow down learning; teachers should regroup information from texts to fit the learning styles of children; (3) when encouraged to do so, students can learn from a variety of sources, freeing the teacher to teach those who need her/him; (4) teachers should encourage rather than discourage students to make learning opportunities; and (5) students should count, record, and chart their own progress; teachers do not have to do this for them.

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While these data are nearly "ancient history" they have not been replicated to my knowledge. Seven years ago when Marilyn Chappell produced these data, we spoke of having a "new standard" by which to measure classroom effectiveness. It seems that this standard has been either out of reach or not aimed for since. I recall Eric Haughton (1979) speaking of encouraging students to make learning opportunities as a way of increasing their "curricular courage". Eric meant the courage of students to try things they did not already know how to do. From the data reported in the Journal of Precision Teaching, it seems that it is not students, but teachers who need to develop a bit of curricular courage. They might start by reporting some results of increasing the learning of entire classrooms of children.

References

**PRECISION TEACHING WITH THE PHYSICALLY IMPAIRED: THEY CAN CHART TOO!**

Eleanor Crawford
Orange County Public Schools

Judy Olson
University of Central Florida

Abstract: This study examined the adaptation of Precision Teaching techniques in the teaching of addition facts to the physically impaired. The students in the experimental group participated in the correction and charting of their progress while the students in the control group completed worksheets from their class text. A comparison of post test gain scores revealed more progress for those students in the Precision Teaching group. An examination of individual charts showed positive learning pictures for all students in the experimental group. The authors suggest the use of Precision Teaching as a viable means of accountability for teachers of the physically impaired.

Perhaps, there is no other area of education where proof of a student's progress is so essential as in the area of exceptional education. Propelled by the passage of Public Law 94-142, an Individual Education Plan (IEP) must be written for each special student. Among other requirements, the IEP must contain goals and objectives plus documentation for determining when objectives have been reached. One technique that may be used to document the student's progress towards achievement of these goals and objectives is Precision Teaching (Lovitt, 1977b). Precision Teaching was first introduced as a useful measurement strategy by Ogden Lindsley in 1965 (Lindsley, 1971).
Employing frequent and direct measurement, a teacher, in using Precision Teaching, may chart either a child's academic or social progress. Behavioral change is measured in terms of movement over time or frequency. In changing an academic skill, the teacher first selects the behavior to change and the goal, designs a probe or practice sheet, records a baseline of that behavior, begins teaching, and charts the daily behavioral changes on the probe assessment until the goal is reached, all the time evaluating the student's progress and the teaching strategy. The charting provides a pictorial picture and documentation of a student's progress.

Research with the visually impaired (Mangold, 1978), hearing impaired (Isaacs, 1976), learning disabled (Bower & Meier, 1981; Johnson, 1971), and educable mentally handicapped (Cohen & Martin, 1971) shows that Precision Teaching produces positive changes in both social and academic behaviors. Yet, there are no studies where Precision Teaching was used with the physically handicapped. This may be due, in part, to the hesitancy of some to using a time-based measure of behavioral change with children who have motor limitations and who may be more handicapped by a technique which requires rapid responding.

However, if Precision Teaching is as effective with the physically impaired as it has been with other exceptional populations, teachers of the physically impaired will have a valuable technique for producing and documenting behavioral changes. The purpose of this study was to examine the effectiveness of Precision Teaching techniques when used to teach addition facts to physically impaired children.

**Method**

**Subjects**

The subjects of this study were six physically impaired students who attended a self-contained classroom in a public school in Florida. All six were staffed into the classroom based on physician's recommendations and all had physical impairments which substantially limited one or more of their major life activities. The subjects ranged in age from 12-13 and in IQ score from 64-76. Four were diagnosed with cerebral palsy and one with Spina Bifida. Four were female, two had no speech and communicated using Bliss symbols, two had very little use of their hands, and three were confined to a wheelchair. The six were matched using these factors and randomly assigned to control and experimental groups.

**Materials**

Worksheets from the third chapter of Heath Mathematics, Level 1, pages 63-90 were used with the control group. These pages contained only problems of basic addition facts, sums 0-10. The Standard Celeration Chart, the A-3 probe, and a stopwatch were used with the experimental group. The A-3 probe is a worksheet of 90 basic addition facts, sums 0-10 produced by the Orange County Public Schools Precision Teaching Project. Three games adapted from Mathematics Their Way were used with both groups.

**Instrumentation**

Subtest, Addition, C-1 from the Brigance Diagnostic Inventory of Basic Skills was administered as the pre and post test. The 24 problems on this subtest were basic addition facts, sums 0-10. The Brigance was selected as this was the assessment tool required to evaluate change according to county guidelines. The researchers tried to duplicate the regular classroom
procedures as much as possible, thereby, in some cases, limiting the experimental manipulations.

Procedure

The classroom teacher administered the addition subtest individually to each student. Since the children were motorically involved, the teacher presented the problems one at a time, visually and aurally. Then each student gave the answer by pointing to a number line. If the student corrected a mistake before the next problem was administered, the problem was counted as correct. There was no time limit on the test. The time of completion, however, was recorded for each student.

During the daily math class, both the experimental and control groups spent the first 10 minutes of the period participating in direct teacher instruction using the various board games. After the games, the control group was given addition fact worksheets from Heath Mathematics. The worksheets were completed using the number line with assistance and were scored immediately with student feedback. The completion of the worksheet, scoring, and feedback took approximately five minutes per student.

After the games, the experimental group participated in Precision Teaching techniques. Each student was given a three-minute timing using the A-3 probe and the number line. After the three minutes, each student was assisted in checking the problems and charting the number correct and number wrong. The timing, checking, and charting took approximately five minutes per student.

The teacher and trained teacher-aide alternated working with the control and experimental groups. The teacher had taken a semester course in Precision Teaching and the teacher-aide had participated in various workshops offered by the Orange County Precision Teaching Project. At the end of seven weeks, the Addition subtest was again administered by the teacher.

Results

Frequency correct was calculated for both the pre and post test scores by dividing the number of correct digits by time taken to complete the test. Then the gain score was computed by subtracting the pretest from the posttest frequency. The pretest, posttest, and gain score frequencies are reported in Table 1. The group exposed to the Precision Teaching techniques performed substantially better than the control group.
Chart 1. Math Performance and Learning for Student 1
Chart 2. Math Performance and Learning for Student 2
Chart 3. Math Performance and Learning for Student 3
Table 1
The Pretest, Posttest, and Gain Score Frequencies
for the Experimental and Control Groups

<table>
<thead>
<tr>
<th>Student</th>
<th>Pretest</th>
<th>Posttest</th>
<th>Gain Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1.8*</td>
<td>13.5</td>
<td>11.7</td>
</tr>
<tr>
<td>2</td>
<td>1.8</td>
<td>9.0</td>
<td>7.2</td>
</tr>
<tr>
<td>3</td>
<td>1.3</td>
<td>13.5</td>
<td>12.2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Student</th>
<th>Pretest</th>
<th>Posttest</th>
<th>Gain Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>1.7</td>
<td>2.5</td>
<td>0.8</td>
</tr>
<tr>
<td>5</td>
<td>1.2</td>
<td>3.9</td>
<td>2.7</td>
</tr>
<tr>
<td>6</td>
<td>1.4</td>
<td>3.8</td>
<td>2.4</td>
</tr>
</tbody>
</table>

* digits per minute

The individual charts of the students in the experimental group (see Charts 1, 2, and 3) reveal good learning pictures and rates of progress. Errors decelerated and corrects accelerated significantly, even for student 2, who was absent for one week.

Discussion

Precision Teaching techniques were successful even with students who were physically limited. However, since Precision Teaching is a multi-faceted approach, it is important to attempt to pinpoint the exact reasons for the gains of the experimental group. The students in the experimental group were exposed to two factors not provided to the control group: (1) timed practice and (2) student charting and immediate feedback using an easily interpreted graphic display. Either one or both of these factors could be responsible for the gains of the experimental group.

The charting component of Precision Teaching appeared to motivate the students, as both the teacher and the teacher-aide reported that the three students in the experimental group kept asking if they could take the charts home and kept reminding the teachers to check their learning pictures. Moreover, two of the students in the control group kept asking for charts. One student in the control group indicated that he needed a chart to see if he was doing better.

In their discussion of data collection, Kerr and Nelson (1983) propose that graphic recording of data not only motivates students but teachers to continue their collection of data. The value of charting is supported in a study by Brandstetter and Merz (1978), who found that a group of fourth graders made greater reading gains when their daily performance scores were charted on a graph as compared to being recorded on a data summary sheet.

Perhaps, the difference in gain scores was due to the participation of the children in Precision Teaching. Lovitt (1977a) has stressed the motivational value of self-management in effecting behavioral change in children. Coleman
(1966), in his study of integration, found that black students were more successful educationally when they felt control over their own destinies. Following the completion of the study, Precision Teaching techniques were used with all the students in the math class.

References


Eleanor Crawford is a teacher of the Physically Impaired, Orange County Public Schools, Orlando, FL. Judy Olson is an Associate Professor in the Department of Exceptional and Physical Education, University of Central Florida, Orlando, Florida 32816.

**A COMPARISON OF THIRTY-SECOND AND SIXTY-SECOND FREQUENCIES**

Karen M. Sroka

University of Florida

The Multidisciplinary Diagnostic and Training Program (MDPT) at the University of Florida (Tesch & Fox, 1984) serves children in kindergarten through sixth grade from fourteen counties in north central Florida. Typically these children are referred because they have exhibited complex medical, learning or behavior problems, or combinations of these, and the referring agent is seeking assistance with determining effective interventions. To address the question of appropriate academic methods or materials, some MDTP children are placed in a specialized diagnostic classroom for a period of six weeks. While there, these students are exposed to a variety of techniques and materials in the areas of math, reading, language arts, and behavior management. The efficacy of many of the interventions is monitored using Precision Teaching. Because these students
are limited to a six week, diagnostic placement and growth in so many areas must be assessed, time for interventions is at a premium.

The procedure of doubling the number correct obtained on a student's thirty-second timing and recording this figure as a one-minute frequency has been used in the diagnostic classroom. This strategy has been suggested by Wolking (1984) when frequency-building is the main objective. The frequency resulting from the doubled count becomes a short term goal for the one-minute performance.

Casual observation of student performance by the MDTP teachers, however, seemed to indicate that the frequency during a one-minute timing usually tapered off near the end of the timing. Student performance during the last half of the minute appeared lower than performance during the initial half. If this is true, the practice of doubling the number correct during a thirty-second timing may actually result in inflated one-minute frequencies. Furthermore, if this practice is used intermittently in combination with recording performance on one-minute timings, an inaccurate picture of student growth may occur and inappropriate decisions may result. The purpose of this study was to examine student performance on thirty-second and one-minute timings and determine if there is a discrepancy between the recorded frequency on a one-minute timing and the recorded frequency obtained by doubling performance on a thirty-second timing.

Method

Participants
Six students beginning the MDTP at various times during the Fall of 1984 were involved in this study. The six students, five males and one female, ranged in age from 8-13 and grade level from 2-6. Prior to beginning at MDTP, two of the students were enrolled in regular education, two in classrooms for the emotionally handicapped, one in a program for the learning disabled, and one in a Chapter I program.

Procedure
After an initial diagnostic assessment of reading skills of each of the six students, probes were selected for those skills which had been found deficient. For purposes of this study, one acquisition level skill was chosen for five of the students. Two skills were chosen for the sixth student. These acquisition probes were then administered for thirty seconds and for one minute each day, utilizing the same probe sheet. The child was instructed to begin at the same point on the probe sheet for each administration. The sequence of administration of the thirty-second and one-minute timings was alternated randomly. This procedure was implemented for four to five weeks for each student. No interventions were implemented for the targeted skill during this time. Students were told only that they were part of a special project.

Frequencies for correct responses derived from the thirty-second timings were recorded and charted. The number of correct responses on these timings were then doubled and charted as one-minute frequencies. During the one minute timings, notation was made when the first thirty seconds had elapsed. Frequencies for correct responses were recorded and charted for the first half-minute, second half-minute, and the total minute. Frequency multipliers were calculated and used to compare the thirty-second and the first half-minute frequencies, the first half-minute and the second half-minute frequencies, and the one-minute frequencies and the frequencies obtained by
doubling the performance scores of thirty-second timings. After frequency multipliers were calculated for each pair of frequencies for each student, the median frequency multiplier was found for each of the three comparisons within and across students.

**Results**

The charted data for student 3a are displayed in Chart 1 and the median frequency multipliers for each student in each comparison are displayed in Table 1. In comparing thirty-second and first half-minute frequencies across students, the median frequency multiplier was x1.1, with four of the students recording higher median frequency multipliers for thirty-second frequencies.

<table>
<thead>
<tr>
<th>Table 1</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Median Frequency Multipliers Used to Compare Frequencies Across Timings, Partial Timings, and Extrapolated Timings</strong></td>
</tr>
<tr>
<td>---------------------------------</td>
</tr>
<tr>
<td>Students</td>
</tr>
<tr>
<td>---------</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>3a</td>
</tr>
<tr>
<td>3b</td>
</tr>
<tr>
<td>4</td>
</tr>
<tr>
<td>5</td>
</tr>
<tr>
<td>6</td>
</tr>
</tbody>
</table>

* Frequencies obtained by doubling performance scores for 30-second timings

In comparing first half-minute and second half-minute frequencies, the median frequency multiplier of x1.4 indicated that the first half-minute frequencies were, on the average, 40% higher than the second half-minute frequencies. The median frequency multiplier range was x1.2-x1.8, indicating that the median first half-minute frequencies were higher than the second half-minute counterparts for all students in the study.

In comparing the one-minute frequencies and the third-second timings with doubled performance scores charted as one-minute frequencies, the median frequency multiplier was /1.2, with a range of /1.1-1.3. One-minute frequencies were, on the average, less, for all students, than frequencies obtained by doubling performance scores for thirty-second timings.

**Discussion**

It has been shown in this study that there is a close association between thirty-second frequencies and frequencies obtained from the first thirty seconds of a one-minute timing. There is a distinct difference in student performance, however, between the first and second halves of a one-minute timing. To double the performance score on a thirty-second timing and report this data as a one-minute frequency is to inflate the frequency substantially.

An important limitation of the study involved the manner in which the probes were administered. Students may have exhibited higher thirty-second frequencies...
Chart 1. Charted Data for Student 3A across Timings, Partial Timings, and Extrapolated Timings

- 30-second timing
- First half of a one-minute timing
- First half of a one-minute timing
- Second half of a one-minute timing
- One minute timing
- 30-second timing doubled

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and first half-minute frequencies because they always began the timings by responding to the same sequence of items.

References


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Editor's note: When a precision teacher charts a 30-second frequency on the Standard Celeration Chart (SCC), using a 30-second counting period floor and a frequency finder, the count is automatically doubled. For example, a count of 10 correct responses in 30 seconds becomes 20 per minute on the SCC. If the charter remembers to mark the counting period floor, there need be no confusion between an actual frequency and a doubled count with an erroneous counting period.

A MOLAR AND MOLECULAR ANALYSIS OF LOGARITHMICALLY CHARTED RUNNING DATA

Bonnie Joyce and Jim Joyce
University of West Virginia

Conservative estimates now indicate that there are 30 million Americans who regularly run for the purpose of recreation and aerobic fitness. Most of these people begin with the simple goal of weight loss or to make the stairs at work less problematic. However simple their beginnings, many runners soon begin thinking of their first race. Next come attempts at racing longer distances, with quicker times. Later, a day or two per week of "speed work" is added to the weekly training regimen to increase the "quality" of workouts. This progress-orientation that seems a natural part of running is also evident in the practice of most runners in logging data regarding their runs.

Another sector in America's running community is made up of elite runners, the members of university track teams, or the "professional" runner who performs at the upper end of the running continuum. Like the serious fun runner, the elite athlete is always looking for a way to improve his or her training and racing performance, and is involved in logging of pertinent data.

Logarithmic charting of running data has been shown to be useful in determining the overall mileage base required for optimum performance at a specific distance (McCrudden, 1985). This article will show how Standard Celeration Charting techniques can be used to provide molar and molecular analyses of a running program, and thereby improve the runner's performance.

One of the early philosophies of the running boom was the L.S.D. (long slow distance) approach to both running and racing (Henderson, 1969, 1977). However, it has now been accepted that running faster in races is enhanced by variety in training, which includes some faster mileage. Even Henderson (1977) now recommends adding this higher quality mileage to the training regimen. Another vital factor in improved running, often neglected by both
elite and fun runners, is getting enough rest. Only by combining sufficient
hard running and rest can a runner work toward the conditioning "peak", which
enables the excellent race performance (Daws, 1978). The conditioning peak
means that the runner's frequency of miles per minutes has increased and
stabilized at its full potential on the day of the race. The runner can not
maintain peak conditioning indefinitely, as he is likely to suffer from
exhaustion, sickness, sore muscles, and other symptoms of being overworked.
Thus, the runner does not want to peak too soon (weeks) before the race.
Likewise, the runner does not want to enter a race with his frequency still
significantly increasing, since this is indicative of not having achieved
maximum potential.

It takes careful planning to reach the conditioning peak on the exact day
of the race. Often, runners peak too soon before the race or are not quite at
optimum condition on the race day. However, through a combination of molar
and molecular analyses of the running program, it is possible for runners to
reach the conditioning peak on time. Below is a description of how molar and
molecular analyses can be applied to running programs to facilitate an
excellent race performance.

Molecular Analysis

Molecular analysis refers to the analysis of small, discrete data over
short periods of time. A molecular analysis is made by plotting the frequency
of miles run (miles over time). In this approach, the runner compares daily
performance to his performance attained on the previous day or across days in
the same week. Thus, the runner tries to increase his pace or distance over a
short time period and may neglect to analyze his improvement over long
periods. Likewise, the runner might compare his frequency from race to race.
In this situation, the runner is comparing performance on two distinct days,
but is failing to analyze all data (frequency points) before, after, and
between races.

Molar Analysis

Although many runners adhere to a molecular analysis of their running
regimen, they frequently neglect the molar analysis. All too often, runners
come under the control of the reinforcement provided by the addition of a few
more miles in the running log. These data are rarely analyzed beyond simple
weekly addition of total miles. However, in a molar analysis, the runner is
concerned with trends across long periods of time. By plotting the
frequencies daily over many months, a true measure of improvement can be
detected. Through a molar analysis, the runner can determine if his
frequencies are significantly increasing, decreasing, or stabilizing. This
information is necessary in determining if the conditioning peak will occur on
or near the scheduled day of the race.

Since it is frequently difficult to apply technology to different areas, an
example of molecular and molar analysis of running, utilizing Standard
Celeration Charting skills, is provided below. Data from one of the author's
running logs were used so that a factual example could be made. Although most
frequency dots were actual, a few were estimated because of factors such as a
forgotten watch or a road that was closed.
Method

Procedure

The runner calculates his daily running frequency and records the data on the Standard Celeration Chart. Periodically, the runner selects a certified race which he would like to run. This selection is made months in advance so the runner can benefit from a molar analysis. After selecting the race in advance, the runner wants to insure peak performance on the race day. Thus the runner sets his dynamic aim approximately one week before the race and works towards this aim. The aim is set one week in advance so the runner can have an easy week directly preceding the race. This is necessary so the runner can begin storing carbohydrates in his system and saving his energy in anticipation of the race.

The runner continues to plot his running frequencies over the next few months and analyzes the celeration to insure adequate progress. If the runner continues to fall below his pre-determined celeration line, he will not reach his dynamic aim on the scheduled date. Thus, he must change his treatment phase by implementing a skill-building option. He can alter his practice environment by running with a partner whose frequency matches his aim. The runner can also alter the task by doing speed work or implementing a motivational strategy such as the setting of daily aims.

In addition to plotting daily frequencies, the runner also plots cumulative mileage for each week. Although this is not a frequency measure, it does aid the runner in seeing trends across larger units of time. Moreover, it serves as a reinforcer for the runner who enjoys seeing a written record of his increased mileage.

Results

A graphic display of the runner's performance is represented in Chart 1. In analyzing the data in Chart 1, the runner sees several factors which are important to the running regimen. First, over a period of five months, daily frequencies increased from approximately .11 to .13 miles per minute. Second, as the frequencies increased, the race performance improved. Frequencies attained in marathon races were: .10 (marathon 1), .12 (marathon 2), and .13 (marathon 3). Third, the addition of speed work (training runs which include several miles of running at a pace higher than the expected race pace) appeared successful in increasing the runner's celeration.

Discussion

Both molar and molecular analyses are important to a running regimen. A runner must select a race date months in advance, establish a dynamic aim, and watch trends in celeration across months. These are all components of a molar analysis.

The runner must also use a molecular analysis to determine if the dynamic aim is being reached. If the data fall below the aim for too many days, then an intervention strategy is necessary. A molecular approach provides the runner with information on when such intervention is necessary. By using Standard Celeration Charting techniques, the molar and molecular analyses become more structured. They provide the runner with an organized decision-making process for establishing aims and intervention strategies. Moreover, the analysis of the running data is easier when data are viewed on a chart.
Chart 1. Running Chart

Marathon 1  15 K  Marathon 2  30 K  Marathon 3

RP  RP  RP  RP  RP  RP  SW  SW  SW  SW  SW  SW

COUNT PER MINUTE

0  10  20  30  40  50  60  70  80  90  100

SUCCESSIVE CALENDAR DAYS

J.J.  32  Runner runs miles

SUPervisor  Adviser  Manager

△=weekly mileage  RP= rest phase  SW= speed work
rather in a table or log. By using these techniques, more runners can improve their running performances, and reduce the number of races for which they are improperly prepared.

References


Bonnie Joyce is now the director of clinical services and Jim Joyce is now the program director of Community Re-entry Services of Arkansas, P.O. Box 90, Benton, Arkansas 72015.

PROBE SHEET CONSTRUCTION

Tom Orloff and Henry A. Tenenbaum
Volusia County Schools

The use of probe sheets in Precision Teaching is a common occurrence. Most probe sheets contain a particular class of skills that a student is asked to perform. In this brief study, attention was given to the construction of the probe sheet.

Two students, ages 7 and 8, attending a school for the behaviorally disordered were given math probe sheets prepared by the Orange County Florida Precision Teaching Project. Student 1 worked on see-write sums 0 to 9 and 0 to 18. Student 2 worked on see-write answers to multiplication facts x0 to 2 and 3-4.

On the probe sheet, the vertical area under the problems where the students were to write the answers was approximately 14/16 of an inch. This area was suspect as a cause for illegible numbers and slow student performance. The students in this study had attempted to write answers that would fill the entire space. During the study, a horizontal line was drawn under each row of problems so that the space between the bottom of the problems and the line was equal to that of standard 5/16 of an inch ruled paper.

Student performance on the ruled probe sheets was compared to that on the unruled ones. The students were not given any additional instructions and were asked to perform on the probe sheets as usual. Scoring criteria for number formation was derived from the Palmer Method (1979). Charts 1 and 2 display the performance of students 1 and 2 respectively. The first phase in each chart displays performance on the unruled probe sheets, while the second phase represents performance on the ruled ones. Table 1 shows the median accuracy ratio of the two students in each phase.
Chart 1. Performance and Learning of Student 1 on Ruled and Unruled Probe Sheets
Chart 2. Performance and Learning of Student 2 on Ruled and Unruled Probe Sheets

SUCCESSIVE CALENDAR DAYS

Student 2  8  see-write answers

Orloff  Tenenbaum/Orloff  SUPERVISOR  ADVISER  MANAGER

Volusia Avenue School  Daytona Beach, FL  AGENCY

BEHAVER  AGE  COUNTER

T.S. Orloff  CHARTER

COUNT PER MINUTE

COUNTING PERIOD FLOORS

MIN  HRS

0  0.001  0.01  0.1  1  10  20  50  100  200  500  1000  16  24

0  5  10  50  100  500  1000

0  5  10  50  100  200  500  1000

Multiplication Facts
0-2
Unruled Probe Sheet
Multiplication Facts 3-4
Ruled Probe Sheet
Table 1

The Median Accuracy Ratios for Unruled and Ruled Probe Sheets

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<td>x2.2</td>
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<td>1</td>
<td>x2.7</td>
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<td>Unruled</td>
<td>1</td>
<td>x2.8</td>
</tr>
<tr>
<td></td>
<td>Unruled</td>
<td>2</td>
<td>x2.6</td>
</tr>
<tr>
<td></td>
<td>Ruled</td>
<td>1</td>
<td>x6.7</td>
</tr>
<tr>
<td></td>
<td>Ruled</td>
<td>2</td>
<td>x8.0</td>
</tr>
</tbody>
</table>

For student 1 there was an increase in celeration for corrects, a decrease in celeration for errors, and a higher accuracy ratio when the ruled probe sheet was used. For student 2 the error frequencies and the accuracy ratios also reflect an advantage for the ruled probe sheet.

The data presented here begins to make a case for careful examination of the construction of probe sheets. By simply decreasing the response area, students wrote answers more accurately and in one case more fluently.

Probe sheet construction may take on many forms. For example, teachers may want to make probe sheets that are used after a student acquires an initial skill. These probe sheets may have the first and the second lines filled with the exact problems that the teacher used while training the student. The next lines might consist of similar problems, varying in one aspect.

References


Precision Teaching Project. Orlando, FL: Orange County Public Schools.

Tom Orloff is an administrator in the Department of Exceptional Student Education, Volusia County Schools, Dempsey-Brewster Building, Deland, FL 32720. Dr. Henry Tenenbaum is now an administrator and teacher with New Medico Head Injury Rehabilitation Center, Wauchula, FL.
WORD CALLING LEARNING: A TWELVE-YEAR-OLD FEMALE WITH CONGENITAL TEMPORAL LOBE AGENESIS

Wynelle Roberson and Bill Wolking
University of Florida

This article reports the learning of a 12-year-old female with confirmed congenital brain damage. Precision Teaching was used to teach the student sight words, which were presented in two groups: one small set of eight words and one large set of 24 words. The primary concerns of the study were the rate of learning and the effect of a small and large teaching set on the same.

Method

Participant

N.S., the participant in this study, was the product of a full term pregnancy. She was delivered by Caesarean section, weighing 5 pounds 2 ounces. She spent three days in an incubator. Motor development was normal, however, language was severely delayed. Antagonistic and self-abusive behavior began occurring at one year of age. The self-abuse stopped when her mother quit her job to stay at home with her, but the antagonistic behavior continued. By age four, she used only a few words, exhibiting mostly whining and babbling sounds. She had difficulty relating to other children and preferred to play alone or with imaginary friends.

At the time of the study, N.S. was residing at the Children's Mental Health Unit (CMHU) located on a large state university campus. She had previously been diagnosed as autistic, suffering from an organic brain syndrome, with severe speech and language delay. Prior to her admission to the CMHU, she had been served in public school programs for preschool handicapped, multi-handicapped, and emotionally handicapped/language impaired children. She was referred to CMHU in 1984 by her classroom teacher, who noted that she had regressed in behavior, academics, and speech and language. When N.S. was first admitted to the CMHU in June, 1984, she was was extremely aggressive and very difficult to control. For this reason, her academic program was limited and treatment focused on reducing her aggressive and non-compliant behaviors. At the time of admission, she was able to identify ten upper case letters of the alphabet, name the primary colors, and receptively identify body parts.

A CT scan performed in 1984 revealed absence of both the majority of the left temporal lobe and the anterior and medial basal portions of the right temporal lobe. Most of the hippocampus and amygdala were missing bilaterally. Her resulting medical diagnosis was agenesis of the temporal lobes, affecting medial temporal regions bilaterally, with secondary congenital amnestic syndrome, developmental speech and language disorder, and organic personality syndrome.

By March, 1986, she was able to identify all upper case letters of the alphabet and her written name, but she was unable to decode or recognize simple words. At this time, reading instruction was begun using the Distar reading program.

In April 1987 psycho-educational testing revealed strengths in motor skills, visual attention, spatial perception, and rote memory, with weaknesses in auditory memory, reading comprehension, and expressive and receptive language. Her overall developmental age was estimated to be between three and six years below her chronological age.
Setting and Time Frame

All academic instruction was conducted by the teacher in the CMHU classroom, a small, quiet room with one small round table and three student carrels. No more than two students, one teacher, and two teacher-aides were present in the classroom during instruction. The instruction was conducted between October, 1986, and October, 1987.

Objectives and Materials

The sight words used in the study were selected in the context of N.S.'s beginning reading program. All words used in the first phase were Dolch preprimer words. Words that made up the small set were: not, away, little, find, my, blue, lock, make. Words in the large set were: and, a, it, can, two, see, up, red, run, I, is, one, the, we, in, to, three, jump, play, look, help, here, said, go. In the second phase, preprimer and primer words were used. The small set was: big, down, where, for, you, yellow, funny, come. The large set was: like, be, no, am, get, brown, at, eat, but, do, came, are, all, four, black, new, ate, he, did, must, into, now, have, food. Instructional materials included: a countdown timer, teacher-made sight word flashcards, sight word probe sheets, the Standard Celeration Chart, writing paper, pencils, water-based pens, and Language Master cards.

Procedure

In each phase of instruction a small and large set were taught concurrently. The first day of each phase served as the baseline. N.S. was presented with the sight word flashcards from the small set and instructed to "tell me the word". She was also told that she could say "I don't know" if she could not decode the word, and that she should keep trying until the timer indicated one minute had elapsed. She was given no assistance or feedback during this first timing. At the conclusion of the timing, she was presented with the flashcards and the correct verbal response to each, and was required to repeat the response while looking at the word. Four words were then selected from the Dolch list in order of their appearance, and she was required to write each word at least five times while saying the word aloud. These steps were then repeated for the large set.

After the first day of instruction, the sight word activity for each set on each instructional day consisted of three steps: warm-up, timings, and contingent error drill. The warm-up activity included the teacher presenting the flashcards to N.S. and asking "what word?". An incorrect or "I don't know" response was followed by the correct verbal response and the question "what word?". A correct response was followed by praise and repeating the correct response. Cards to which N.S. responded incorrectly were placed in a separate stack. The procedure just described was then repeated with these words.

Following the warm-up, two timings were taken, and the best performance was recorded on the Standard Celeration Chart. Prior to each timing, N.S. was instructed to "read as fast as you can" and to say "I don't know" if she came to a word she could not remember. During the timings the teacher said "good" after a correct response, but would ignore an incorrect one. After each timing the teacher presented N.S. with the words she had read incorrectly and followed the same procedure as described in the warm-up activity. A contingent error drill was then conducted in which N.S. was asked to write each word she had missed during the timings at least five times while saying the word aloud. Additional independent practice was then provided on the Language Master.

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After 11 instructional weeks, the small and large sets were presented on probe sheets, rather than flash cards. After an additional 17 weeks for the small set and 18 weeks for the large set, a new phase was implemented, that is, a new set of words were presented.

This sight word instruction was conducted concurrently with a Distar reading program. The instruction, however, was not continuous: each week consisted of 2-4 instructional days, with occasional gaps in instruction from 1-9 weeks. During these gaps, N.S. received no reading instruction or practice in sight word identification.

Results

Charts 1 and 2 display N.S.'s performance and learning for the small sets, while Charts 3 and 4 display the same for the large sets. In the one year period of time, there were five suspensions of the study due to illnesses, vacations, or holidays. The abscissa of the Standard Celeration Chart has been changed to "days" and does not reflect these suspensions. The initial accuracy in the first phase was 3% for the small set and 11% for the large set. During the second phase, the initial accuracy was 25% for the small set and 33% for the large set. These measures indicate that the large set was slightly easier to do than the small set in both phases. These measures also indicate that both sets were substantially easier to do in the second phase.

Overall celerations for each phase were calculated with the aid of a computer program. Empirical research has shown that celeration values derived from this program are highly correlated with those derived using the quarter-intersect method. In the first phase, the overall celerations for correct and incorrect responses for the small set were x1.09 and /1.07, respectively. For the large set these values were x1.05 and /1.06, respectively. In the second phase, the overall celerations for correct and incorrect responses for the small set were x1.22 and /1.31, respectively. For the large set these values were x1.20 and /1.28, respectively. While these overall celerations indicate only minor differences in learning between the small and large sets, they do indicate that the rate of learning on both sets was higher during the second phase.

Prior to the change to probe sheets in the first phase, the celerations for correct and incorrect responses were substantially higher for the small set. In addition, the error frequency was "zero" per minute for the small set and six per minute for the large set, indicating that the small set was initially easier to learn. By the end of the first phase, however, the performance on both sets was nearly identical, 85 words correct per minute with "zero" errors. Prior to the same change in the second phase, the celerations for correct and error responses were nearly the same for both sets. At the end of this phase, the frequencies for both sets were again nearly identical, 65-70 words correct per minute with 0-2 errors.

Discussion

These data suggest that a young girl with significant brain damage can learn to read large sets of words at nearly the same rate as comparable sets only one-third as large. The data also suggest that the rate of learning may increase with new sets. This should send out a message to many teachers who are hesitant to use large sets with normal or mildly handicapped children.

During this year long instructional program, the teacher was continuously reinforced by the charted data. When the teacher was able to see the small
Chart 1. Performance and Learning by N.S. on an eight-word data set
Chart 2. Performance and Learning by N.S. on an Eight-word Data Set
Chart 3. Performance and Learning by N.S. on a 24-word Data Set
Chart 4. Performance and Learning by N.S. on a 24-word Data Set
growth from day to day and week to week within the long first phase, it was enough to keep her working with N.S. toward the aim. If the teacher had given up, she would never have seen that N.S. could learn at an even more rapid rate.

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PRECISION TEACHING: FEELING FIXER

Tom McCrudden
Omaha Public Schools

The purpose of this article is to demonstrate that, by counting your inner feelings (i.e., positive and negative), you can become more aware of events which affect these feelings, discover things about yourself, and develop strategies to help change them.

I began charting my inners on November 29, 1981, after reading an article by Abigail Calkin (1981). I defined inners as those feelings that affected me "very" positively or "very" negatively. "Very" is difficult to define; some examples might be helpful. For instance, consequent feelings from a funny movie would not necessarily be counted as "positive". If I saw a person do a kind deed, however, I might count that as a "positive". Similarly, the fact that I do not like a certain political policy (e.g., tax loop holes) might not be counted as a "negative". If I heard about an 80-year-old woman getting mugged and raped, however, that might be counted as a "negative". This is something I really appreciate about PT-- it respects the learner enough to allow him/her to define an inner according to his/her own unique criteria.

Chart 1 is my feelings chart. Data from the following days helped me learn, discover, and change:

1- July 10: I helped my friend with his going-out-of-business garage sale; there was a jump-up in positives;
2- July 18: We closed on our new house and the buyer's loan for our old house was approved; there was another jump-up in positives;
3- July 21: We took possession of our new house and started moving by car-loads; there was a jump-up in positives;
4- July 22: The moving men came and we also moved by car-loads; I was happy we were moving, but I was also sad to leave the house where we lived for 13 years and where we had had much fun; there was a jump-up in both positives and negatives;
5- July 23-25: I went to our old home to clean and get it ready for the new owners; I experienced sad feelings and decided to use the following strategy: whenever I experienced a sad feeling about the old home, I would think of why I was moving to the new house (e.g., more space, less maintenance, etc.); this made me feel happy; notice the "jaws" learning picture-- an acceleration in positives and a deceleration in negatives; in fact, I started generating positive thoughts about the new house, which produced positive feelings in me; as a result, the positive thoughts were not

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always contingent on a sad feeling; this was a re-discovery for me—an additional strategy I had known but had forgotten to use;

6- July 26-28: I was anticipating the visit of my cousin and his wife from Ireland on July 27; we had a party for my cousins on July 28; there was a continuation of the "jaws" learning picture;

July 29: My cousin and his wife leave; there was a jump-down in positives and a jump-up in negatives;

7- September 15: There was an explosion near one of the schools to which I am assigned; my supervisor sent me to the school to assist; there was a jump-up in positives and negatives; a re-discovery for me—keeping calm in a crisis;

8- September 19: I received a decision regarding a case that annoyed me very much; what annoyed me was the way the decision was made; there was a large jump-down in positives and a corresponding jump-up in negatives;

September 20-24: The continued high frequency of negatives was a result of the decision process; the positives, however, accelerated;

September 25-27: I was thinking about the weekend; there was an acceleration in positives and a deceleration in negatives;

September 28: I anticipated a meeting on September 30; there was a jump-down in positives and a jump-up in negatives;

September 29: I was still anticipating the meeting; there was a jump-up in negatives; I decided what to do at the meeting; there was also a jump-up in positives;

9- September 30: The meeting occurred; there was a slight jump-up in negatives; I remained calm with my decision and discussed the situation with my friend after the meeting; there was a large jump-up in positives;

October 1: I made a decision and executed it; there was a jump-down in negatives;

10- October 2-4: I attended the Precision Teaching Conference in Jackson, Wyoming; there was a jump-up in positives and a jump-down in negatives.

In summary, I chart my inners daily to learn, discover, and change. I discovered that feelings, like academic behaviors, are independent of one another (see July 22). I have learned that certain types of events affect my feelings strongly. I have also discovered or developed strategies to control or change these feelings and events. Additional consequences of charting inners include: feelings of being in control, self-confidence, and relaxation.

Reference

Tom McCrudden is a school psychologist with the Omaha Public Schools. He resides at 6625 Stratford Circle, Omaha, NE 68137.

PROFICIENT FREQUENCIES: HAVE WE LOST SIGHT?

Paul Wanat

During the course of attending nine presentations at the Sixth International Precision Teaching/Precision Learning Conference in Jackson, Wyoming in 1986, I became concerned about some applications of PT. This
concern does not center around unproven theoretical stances, semantic
differences, or other trivial nuances, but rather upon the apparent disregard
or misunderstanding of one of the foundations of PT, namely proficient
frequencies. I noted the following activities being used with students in
what were professed to be academic PT programs:

(1) On two different occasions, presenters stated that they did not
use frequency aims with their students; and

(2) One presenter displayed student charts with no aims and xl
CELERATIONS; when questioned, the presenter stated that this was acceptable
and that learning had taken place.

The effective and efficient performance of all types of skills occurs not
only at high frequencies, but at specific proficiency ranges, which apply to
all learners whose motor and neurological channels are not impaired.
Proficient performance in tool skills and basic skills often leads to the same
in advanced skills. The failure to use frequency aims ignores a vital stage
of learning, sells students short, and reduces performance and learning to a
hit or miss affair.

Accepting or setting low frequency aims is no different than going on to
chapter 2, because chapter 1 was taught last week. It ensures only that
material was presented and tells us nothing about the quality of performance
on the present task, the potential endurance of that performance, and the
future learning of more advanced material. The thrust of our professional
practices as precision teachers should be discovering ways to accelerate
student performance and learning, not getting through the curriculum. Rather
than taking the slow and handicapped learner and producing an accelerated
learner and performer, some of us are using available technology to redefine
slow and handicapped learners in PT terms. Does it really matter what
medication is administered if the disease is terminal?

In all cases, we must set proficient aims for students to receive maximum
benefits from the learning situation. What do we do with students, however,
who consistently demonstrate low frequencies even when curricular slicing has
been employed on several occasions? The answer, I believe, is building up
frequencies to proficient levels in the appropriate tool skills. I have found
that most students can accomplish this task in 5-7 days. When this skill is
reapplied to the curricular pinpoint, frequencies accelerate. To further
facilitate maintenance of the tool skill, I have had students do tool skill
AND curricular timings for several days after the latter has been
reintroduced.

The significance of proficiency must not be forgotten or abandoned. To do
so would be detrimental to students and would threaten the credibility of
Precision Teaching. The proliferation of Standard Celeration Charts with
celerations and frequencies that hardly compete with the production of
traditional instruction will only serve to convince others to continue current
practices.

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