My Early Days of Behavior Analysis with Skinner: Light and Heavy Memories
Ogden R. Lindsley

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Camelot's First-grade Reading Pilot: Report of Performance and Learning Effects from Three Years of SBG's World of Reading with the '93 Class Enhanced by SRA's Reading Mastery, Fast Cycle I/II and Precision Teaching
Malcolm D. Neely
The *Journal of Precision Teaching* (ISSN 0271-8200) is a multidisciplinary journal that is dedicated to a science of human behavior which includes direct, continuous and standard measurement. This measurement includes a standard unit of behavior, frequency; a standard scale on which successive frequencies are displayed, the *Standard Celeration Chart*; a standard measure of behavior change between two frequencies, frequency multiplier, and a standard, straight-line measure of behavior change across seven or more frequencies, celeration. Frequencies, frequency multipliers, and celerations displayed on the Standard Celeration Chart 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 accelerate the sharing of scientific and practical information among its readers. To this end, both formal manuscripts and informal, Chart-sharing articles are to be considered for publication. Materials submitted for publication should meet the following criteria:

* be written in plain English
* contain a narrative that is brief, to the point, and easy to read
* use the *Journal of Precision Teaching* Standard Glossary and Charting Conventions (See Volume X, Number 2, Spring, 1993, pp. 79 - 82.)
* format references according to the *Publication Manual of the American Psychological Association*
* contain data displayed or displayable on the Standard Celeration Chart to justify conclusions made
* direct data points may be submitted, so the Charting Macro program (Slocum, 1990) may produce an electronic version of the Chart
* original charts may also be submitted.

Articles which are not data-based and do not include data displayed on Standard Celeration Charts may be included. These articles should substantially contribute to the development or dissemination of Precision Teaching/Learning. “About PT” is a column for shorter notes.

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Claudia E. McDade, Editor
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*Editor Emeritus*
Ogden R. Lindsley

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A Publication of
The Standard Celeration Society
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As the 1993-1994 academic year comes to an end, we find ourselves in the Center for Individualized Instruction at Jacksonville State University putting another volume of the Journal of Precision Teaching to bed. It is for us the time of year we must document our successes and failures since our last evaluation in June, 1993. Each year we are amazed at the progress we have made and the goals we have reached--even as we marvel at how much more we have to do to make education truly accountable in terms of student outcomes.

In editing this issue of the Journal, we are again reminded in positive and joyous ways that we are part of a movement so much bigger than any one of us which has the potential to truly reform education.

We are reminded of our roots as Ogden Lindsley reminisces about early applied behavior analysis with Fred Skinner, as well as reminded of the necessity of learning from the data by Ogden's attention to the least expected datum, the outlier. Ogden also reminds us of our continuing evolution by introducing his new term "peaches" to correspond to his term "lemons". He brings us back to our early tradition of "cooperative singing" in a special thanks to the Northern California Association for Behavior Analysis.

We are reminded that our movement results in true development of skills across ages and tasks. In Malcolm Neely's meticulous study of reading among high-risk students at Camelot Elementary School across three years of three different interventions, we are reminded again what really works to ensure reading success for all students. Richard Kubina and Manfred Haertel join John Cooper's interest in inners to apply Abigail Calkin's procedures to decreasing senior citizens' negative inner behaviors. They remind us that much remains to be done to apply this powerful technology to many who need it. Personally, I would like to see the methodology applied to adolescents as they are expressing low self-esteem.

By setting mastery goals for themselves, Kim Weber and Emily Noland remind us of the necessity of demanding of ourselves what we demand of our students. Kim used Precision Learning System's courseware to teach herself WordPerfect and reminded us of business' need to utilize Precision technologies to develop competence, rather than provide training. Emily demonstrated again that one can master an underdeveloped skill beyond the "normal" age for attainment.

Enjoy this issue of your Journal of Precision Teaching! Remind yourself of your contributions to your students' skills development through Precision! Get the big picture by seeing your place in it! Keep the effectiveness of Precision Measurement alive! Keep charting, folks! Send us your contributions for the next issue--whether three year studies of many students or one behavior change in yourself! We must share our successes and our failures to grow and remain effective -- even as we marvel at how much more we have to do to make education truly accountable in terms of student outcomes.
Letter to the Editor

29811 6th Avenue, South
Federal Way, WA 98003
17 Mar 1993

Dr. Claudia E. McDade
Editor, Journal of Precision Teaching
Center for Individualized Instruction
Jacksonville State University
Jacksonville, Alabama 36265-9982

Dear Claudia:

...How much basic information to include is always a puzzle for me when I write. If we are doing our job, JPT should have beginning readers, experienced readers, and all those in between. I feel the Journal should not only inform, but continually teach and reteach.

On 18 Jun 93 I wrote to point out the lack of standardization when JPT forbids add/subtract charts but permitted add/subtract tables and dialogue. It appears we should examine the Standard Celeration Society's standards and standard celeration some more.

Whalen, Willis and Sweeney's article in the JPT XI, 1 issue reports timed trials without reference to a calendar scale. When they do this, they violate the definition of celeration. This data could have been charted on successive calendar days: it just was not. Had it been, Phase II celerations would be more dramatic. As it is, the data trends mean nothing outside of this report. In fact time-trials without reference to calendar days or parts of calendar days (e.g. count per min., per ten min., per hour, as charted on a modified monthly Chart) show no standardization--but should in the Standard Celeration Society's Journal.

Review of the Whalen and all article also suggests we have not done a good job teaching other concepts and terms. First of all they write on page 6, "Due to the large variability evident during the alternating treatment sessions of Phase I, it was difficult to determine appropriate celerations for the 1 and 3-minute timings." A wide variability (bounce) does not impede the drawing of a celeration; celerations can have any size of bounce. What caused the difficulty of determining any trend line, here, was lack of enough data. Three trials or days does not establish a trend. The authors could have discussed median and variance for their references and comparisons with their Phase II.

Secondly, Whalen and all discuss "jump up" when comparing the first three days of Phase II with Phase I. Precision Teaching uses jump to refer to frequency changes from one phase to the next, and turn to refer to celeration changes. In the Whalen article, the frequencies and trend-lines of Phase I's three one-minute timings and the first three one-minute timings of Phase II probably show a jump down and turn up. Actually the pupil simply rank-ordered his Phase I trials with his first three Phase II trials. The four-minute trials suggest a x1.3 jump-up and similar turn-up--hard to tell without calendar charting.

Stump, Boone, Higgins, and Notari's article in the JPT XI, 1 issue is a combination of calendar and trial data. The text describes the procedure, but the
Charts do not show what the text describes. All four Charts show one-minute timings, but the text describes 30 second timings. Other than that, baseline data looks to be charted as described.

Stump and all's text intervention data tells us timings were once on Friday and twice on Monday or twice on Friday and once on Monday depending upon the group. All Charts show Monday, Tuesday, and Wednesday timings. Actually, only two calendar days are involved—the twice-on-a-day timings are trials.

Stump and all's text maintenance data tells us timings were Monday, Wednesday, and Friday; yet the Charts show Monday, Tuesday and Wednesday. In addition, all chart phases are connected leading one's eye to blend every phase into one.

Table 1 would have made a grand static chart to show no differences other than the medium pupils. Table 2 (un-numbered) shows another add/subtract comparison in a multiply/divide journal, and I'll not belabor that more.

And finally Stump and all's article compares celeration. On page 26 they define celeration as "last correct data point divided by the first correct data point." Last I checked Pennypacker, Koenig, and Lindsley celeration was the rate of change of count per minute per day per week determined geometrically either by visual analysis or split-middle, quarter intersect methods and drawn with a pencil and straight edge. Determining a celeration is not dividing Sunday's data by the previous Monday's data. Celeration is read from the seventh day angle distance on the Standard Celeration Chart.

Perhaps there is something I do not know about our journal. Ogden tells me no one is reading it—including the subscribers. How about the field editors and editors?...

Yours in Charting,

Malcolm D. Neely
(206) 941-7529 (home)
MY EARLY DAYS OF BEHAVIOR ANALYSIS WITH SKINNER: LIGHT AND HEAVY MEMORIES
Ogden Lindsley, University of Kansas

Introduction

What follows this paragraph are the two pages of the handout I used at an invited address before the Behavior Analysis program at Sacramento State University in California on 10 February 1994. This was the first time I ever accepted an invitation to do an historical presentation. This handout may interest the readers of the Journal of Precision Teaching.

1950 - Harvard

I received my Masters in electro-physiology with Carl Pfaffman at Brown, but had to leave because a new graduate dean said no more three degrees at Brown. I obtained a scholarship to study single-nerve-fiber micro-electrode recording with Robert Galambos at Harvard. In the other end of the laboratory Skinner was operantly conditioning pigeons and rats, but I didn’t know it then.

1951 - Samson

Skinner asked me to assist him in teaching Natural Sciences 114. The class notes were published later as Science and Human Behavior, 1953. Skinner asked me to train a high jumping rat for a class demonstration. One rat pulled the bar rather than jump it. I added weight to the bar and he was lifting 250% of his body weight in 2 weeks! Samson rat was the hit of the class and made me a life-long free-operant conditioner.

1952 - Hunter

As my dissertation research options, Skinner suggested studying drug effects on pigeons with Otto Kryer at Harvard Medical School, or studying irradiation effects on dogs with Walter Jetter at Boston University Medical School. I chose the dogs because I thought them closer to humans than pigeons. I conditioned 65 male Beagle dogs to tell time, discriminate a light, and fear a loud noise. The immediate effect of irradiation extended the fear without changing the temporal or visual discriminations or rate of work.

1951 - Cathy

Our youngest daughter, Cathy, slept in an air crib during her first two years. Many other of Skinner’s students had raised their children in air cribs, but no one had put in a lever. I built a toy panel and recorded Cathy’s playing over 24 hour periods. This, my first human free-operant research, was presented at the Eastern Psychological Association meeting and written up in Newsweek.

1953 - Behavior Research Laboratory, Metropolitan State Hospital

When meeting to discuss my dissertation research, Skinner and I talked about how exciting it would be to work with psychotic patients. We had ideas like reinforcing a catatonic out of his stupor, thinking the stupor to be merely the result of total behavioral extinction. We agreed to apply for a grant and I would give it 5 years of my life. We obtained funds from the Office of Naval Research, and construction started 5 July. Our first patient was studied on 28 September. We first called our laboratory “Studies in Behavior Therapy.” From 1953 through 1964 we had 940 professional, and 1850 student visitors.
1953 - Reinforcer search

A wide range of reinforcers - food, candy, cigarettes, money, nude male and female pictures, even the opportunity to feed a hungry kitten, were tried to generate useful rates of response in withdrawn patients; all with no real luck.

1954 - Hallucinating, pacing, and lever pulling

Simultaneous recording on 3 separate cumulative recorders of hallucinating symptoms (talking to no one), pacing symptoms, and lever-pulling for reinforcers, provided interactions between symptoms and work. These sessions were excellent for screening psychotherapeutic drugs. None were found that decreased symptoms without also decreasing normal work.

1957 - Conjugate Reinforcement

A device that increased the intensity of a visual or auditory television signal directly with the rate of response was built to present narrative reinforcers. Narrations lost their reinforcing power when interrupted by episodic reinforcement schedules. In conjugate reinforcement the video wasn’t interrupted if the patient slowed down, it merely dimmed, or went out of focus. The conjugate schedules went more deeply into sleep, anesthesia, and coma than episodic schedules and could be used to measure the depth of sleep and anesthesia. Conjugate schedules also analyzed simultaneously both auditory and visual channels of movies, TV commercials, and psychotherapy sessions.

1960 - Simultaneous discrimination and differentiation

By having 2 levers and 2 lights, and reinforcing pulling the lever under only one light we could monitor developing discrimination (telling the lights apart) and differentiation (telling the levers apart). This research showed that some psychotics and some retarded persons had very unusual behavioral deficits.

1961 - Seven hour drug screening sessions

Daily recordings of the behavior of over 70 chronic patients revealed marked 20 to 35 day rhythms which were not related to phases of the moon, or barometric pressure. These rhythms severely interfered with measuring the effects of psychoactive drugs, which took a month to take effect when taken orally. We went from 1 hour to 7 hour daily sessions, and from oral to intra-muscular injections of the drug after 30 minutes base-line responding within the session. This permitted us to record drug onset, full effect, and final decay on the vocal symptoms, pacing, and work. Screening new psychoactive drugs was our major source for laboratory costs which were up to $250,000 per year.

Some light memories

Floods: every month or so patients in the three floors above us would stuff torn blankets down their toilets. These jammed in the sewer lines below our lab and suddenly we would have about 2 feet of sewage over our floors - no warning! Skinner’s hands: if he inadvertently touched a door handle, Fred would hold his hand out to his side until he could disinfect it at the nurses station. It was great fun to try to get him to touch a door handle, and to tease him about this! Cockroaches: Working late at night I went through dark basements to get coffee from the night supervisor’s office. Giant cockroaches scampered before me, and I stamped on them. I developed the superstition that each one killed was another thousand dollars in next year’s grant. This kept me in the corridors until I got the 100 we needed. Was Skinner right? Was it catching?
Politics diverted psychosis money to retardation: Our builder told us Rosemary Kennedy was really psychotic and made defective by a pre-frontal lobotomy. Convinced that he would not get elected with a psychotic sister, Jack Kennedy called her retarded and supported retardation as a smoke screen. Psychotic episodes were catalyzed by calling a patient’s name over a hidden microphone. But, the patient asked the “voice” a silent question, and if it wasn’t answered, the patient knew the “voice” wasn’t his. Behavior analysts dropped rate of response in copying our methods and success, preferring to use percent correct or percent of time behaving. Drug screening an impossible gamble since we were getting only 1 new drug a year after thalidomide. The Curies screened hundreds of metals, their salts, and compounds before finding pitchblende. Edison screened over 1600 materials before finding carbon coated cotton for his incandescent lamp. If we were sixteen times luckier than Edison we’d find a drug for schizophrenia with our 100th try. That would be in the year 2065! We closed our lab.

Dr. Ogden R. Lindsley is Founder of Precision Teaching and Professor Emeritus at the University of Kansas, Lawrence, KS 66045. Dr. Lindsley was the first to apply Skinner's principles to humans.
PEACHES AND LEMONS AID CLINICAL DISCOVERY

Ogden Lindsley, University of Kansas

Introduction

What follows this paragraph is the two pages of text and two daily charts that I handed out at my Keynote Address before the Northern California Association for Behavior Analysis on 12 February 1994. This was the first time I presented the fruit metaphor (peaches and lemons) for exceptional outlier days. The night before they surprised me and honored all of us in the family of Precision Teaching by giving me their annual "Outstanding Contributor to Behavior Analysis "award. I accepted by singing them a parody to "California Here I Come," which appears elsewhere in this journal issue.

Background

Most Applied Behavior Analysts monitor their clients' behavior before, during, and after treatment. This is done to observe treatment effects and to custom tailor the type and amount of reinforcement. There is an opportunity to discover clinical variables unique to each client by noting exceptional days and discovering what may have produced them. Few of us have taken this opportunity to discover unique variables for improving our clinical results.

What are Peaches

Peaches are unusually high frequency performances in something you are trying to accelerate, or unusually low frequencies in something you are trying to decelerate. They are unusually "good" performances. If you can find out what produced them, you might use that variable to improve performance on the other days. Peaches can be a day in a sequence of daily observations, or an outlying dot in a distribution of frequencies from different performers. Gilbert (Human Competence, 1978) used the term "exemplar" to describe the most highly skilled performers who should be analyzed as performance models.

What are Lemons

Lemons are unusually low frequencies in something you are trying to accelerate, or unusually high frequencies in a deceleration target. Gilbert did not write about learning from unusually high or low days, nor from unusually low performers. However, it is just as important to learn "what not to do" from lemony days and lemony performers as it is to learn "what to do" from peachy days and peachy performers.
Normal curve statistics estimates the probability of an outlier by how many standard deviations it is away from the center of its distribution. This is very hard to see in a baseline or treatment portion of a behavior chart. It is easier to see the distance between the outlier and the nearest edge of the distribution. It is also easier to judge this distance by how many total bounces or spreads the outlier is away from the rest, than to estimate standard deviation distances.

<table>
<thead>
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<th>Bounces away from edge of course:</th>
<th>Probability in one out of a:</th>
<th>(Standard deviations from the mean)</th>
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<tbody>
<tr>
<td>Half</td>
<td>Thousand</td>
<td>4</td>
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<tr>
<td>One</td>
<td>Million</td>
<td>6</td>
</tr>
<tr>
<td>One and a half</td>
<td>Billion</td>
<td>7</td>
</tr>
<tr>
<td>Two</td>
<td>Trillion</td>
<td>8</td>
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The memory aids are: across - "Half a bounce is half a Ton (Thousand)," and then down - "Thousand, Million, Billion, Trillion."

Since the SCC normalizes variance (making up bounce equal down bounce) and equalizes variance (keeping bounce constant as frequencies increase or decrease) peaches and lemons are much easier to see on SC Charts.

I first noticed the power of outlier days in September 1966, in my first behavior analysis class for fathers of retarded children. They were to "pinpoint a behavior, record it's daily frequency, and bring the counts to class next week."

One father pinpointed loud screaming by his twin daughters and brought in counts of from 35 to 100 screamings per day. When in their station wagon, the father reported the screams were louder and startled him so much that several times he barely avoided accidents. He separately counted these in-car screamings at 6 and 7 during two 20 minute drives. When charted, the in-car screamings are 5 times more frequent than the other screamings, and are one full bounce away from the others. This shows that they would happen by chance only one time in a million.

After only this first week of counting, I told the father to take heart. The screamings could not be due to a run-away cerebellum, as a neurologist had told him, but were under environmental control! Because, who ever heard of cerebellums that ran 5 times faster in Fords? I told him that in two months we could stop his daughters' loud screamings. We just had to figure out a contingent change that would work.

The first try was to have each girl tie a handkerchief over her mouth immediately after each screaming for 15 seconds. This divided the frequency in half, jumping down to about 25 per day. Note that the in-car screamings also consistently divided, staying 5 times faster than the others. The next suggested try was to increase the dosage of self-masking to 120 seconds. This turned the screamings down to divide by 2 every week, taking 4 weeks to get down to the aim of zero per day where they maintained.
In workshops and presentations I urged Precision Teachers to search for exceptional days (I had not yet called them peaches and lemons at that time) to get ideas for improving their students’ academic and social behavior.

In 1971, Bill Hulten and Warren Schoonmaker sent me Phillip Dunn’s chart of the number of pages he collated per minute in the sheltered workshop at the Experimental Education Unit of the University of Washington. For the first 5 days his frequency dropped from 20 to 4 per minute, dividing by about 5 per week. Bob Bozich and Dan King offered Phillip a token for every 50 pages collated which had no effect. Phillip’s performance continued to decelerate to 10 pages collated per 10 minute session.

After 4 weeks the managers noted that there were 4 peachy days in which he collated from 30 to 130 pages. On these days Phillip was 3 to 5 times faster and the days were at least a full bounce away from the others - one out of a million by chance! Asking Phillip and checking their records they discovered that on those days the worker who collated pages at the same table was absent and Phillip had the table to himself. The managers gave Phillip his own work table and he collated over 50 pages per 10 minute period without tokens.

A survey of the 26 reprinted published Charts in Keith Miller’s, *Principles of Everyday Behavior Analysis* revealed 6 ignored peaches and 1 ignored lemon. Peaches and lemons occur in daily, weekly, monthly and yearly frequencies. They are usually ignored. I urge you to analyze yours, discovering exciting new treatment variables and becoming more effective.

Dr. Ogden R. Lindsley is Founder of Precision Teaching and Professor Emeritus at the University of Kansas, Lawrence, KS 66045. Dr. Lindsley was the first to apply Skinner’s principles to humans.
*Got idea from four high days when other patients were absent.
Self-Masking

X--in car
O--in car--forgot masks

15" 120"
CALIFORNIA, THANKS A TON!
Ogden R. Lindsley, University of Kansas

The award
At its thirteenth annual conference the Northern California Association for Behavior Analysis presented its annual “Outstanding Contributor to Behavior Analysis” award to me on the evening of 11 February 1994 in Oakland.

My dilemma
As I am really a very shy person, I seldom know how to accept compliments. For my entire youth and young adulthood I used to deprecate myself. When I was complimented on my sports jacket, I would put my head down, and mumble while pointing to a worn sleeve, that it really is just an old worn jacket left over from my high school days. This of course, put down the complimenting person.
In an early Precision Teaching workshop in Hibbing, Minnesota, a lovely, concerned, middle aged teacher told me during the noon break, “Dr. Lindsley, you don’t know how to accept compliments! You hurt people’s feelings.” I answered, “I know it. I have always had trouble accepting compliments. No one ever taught me what to say.” The wise teacher answered, “I will teach you now. Just say, ‘Thank you, thank you very much.’”

However, after the long and complimentary introduction that Joe Morrow had just given me, it would have been totally disrespectful just to say “Thank you, thank you very much,” and sit down.

Our early song tradition
In the early 1970’s it was a tradition at Precision Teaching workshops for the trainers to make up a complimentary parody of a well known folk song the night before the last day. At the closing the next afternoon all the participants in the room would sing along with the bouncing pointer to the words on an overhead projector. Hank Pennypacker, of Precision Teaching of Florida, was exceptionally good at making up these parodies.

---

1 I even sang my introduction of Hank Pennypacker, the incoming president of the Association for Behavior Analysis, before his presidential address.
following this tradition, my solution token of gratitude was to sing them one of their california songs. the lyrics went:

 california, here i come.
 right back where i started from.
 where bower of flowers,
 bloom in the spring.
 each morning, at dawning,
 the birdies sing and everything.
 a sun-kissed miss says “don’t be late.”
 that’s why i can hardly wait.
 open up your golden gate.
 california, here i come!

then i sang for them the very rare second verse, that i said i had located in the technical library of the university of lethbridge in canada. here are those rarest of rare second verse lyrics:

 california, thanks a ton,
 for recognizing what we’ve done.
 however, i never
 did it alone.
 it started with skinner,
 then carl, eric, hank, harold and owen too.
 samson’s, hunter’s, and lester mccabe’s
 charts taught us how they behaved.
 they all proved performance multiplies!
 california, thanks a ton!

2 i lied.

dr. ogden r. lindsley is founder of precision teaching and professor emeritus at the university of kansas, lawrence, ks 66045. dr. lindsley was the first to apply skinner’s principles to humans.
The Effects of Precision Teaching and Add-A-Word Spelling on Spelling Performance of an Adult Graduate Student

Emily Noland, T. F. McLaughlin, and William J. Sweeney

The effects of the add-a-word spelling procedure and timed Precision Teaching techniques on a female adult graduate student were evaluated. An increase in corrects and a decrease in incorrects on daily spelling tests, after the add-a-word and timed Precision Teaching were introduced, indicate the effectiveness of the procedure.

Spelling is a difficult subject area for many students because standard English does not follow consistent rules (Smith, 1981). Children quickly learn to apply spelling rules but have difficulty discriminating between appropriate and inappropriate rule application. Some youths will become adults without mastering the ability to functionally spell. Spelling accuracy is considered a measure of literacy in our culture (Hansen, 1978). Acquisition of spelling and writing skills is required by society and necessary for adults to cope successfully with life (Smith, 1989).

Vogel (1993) discussed the increasing demands on institutions of higher education to provide effective educational services for nontraditional students with a variety of learning difficulties. As more and more nontraditional students with a variety of learning problems are applying and are accepted into institutions of higher education (Berliner, 1993), these services become increasingly more difficult to deliver efficiently and effectively. Therefore, developing data-based instructional procedures for adult learners that are effective, cost-efficient, and user friendly is becoming increasingly important in today's society (Sweeney, Omness, Janusz, & Cooper, 1992).

Literature has indicated that the add-a-word spelling procedure (McGuigan, 1975), or Copy, Cover, and Compare (Murphy, Hern, McLaughlin, & Williams, 1990), has been more effective than traditional fixed list methods of spelling instruction. The add-a-word procedure makes use of small lists of words, practice until mastery, error drill, and maintenance probes after a word has been mastered. If a student were to spell the word "acceleration", the word would be copied from a sample; the student would then write the word again from memory; the written word would be compared to the correct sample, and this process would be repeated until the student wrote the word correctly from memory. Then, the next new word would be added. The add-a-word procedure has resulted in improved spelling performance for students with mild handicaps (McLaughlin, Reiter, Mabee, & Byram, 1991), and students that have received special education services for reading difficulties (McAuley & McLaughlin, 1992). Pratt-Struthers, Struthers, and Williams (1983) found the add-a-word program improved spelling performance of students with learning disabilities and increased generalization of spelling words to creative writing. However, there has been little research to determine the effects of the add-a-word program on spelling performance of the adult population.

Precision Teaching is an instructional procedure that incorporates a direct, continuous, and precise measurement system, which has provided a strong basis for instructional decisions (Lindsley, 1991). According to Mercer (1986), Precision Teaching has provided a direct and simple model for teachers. It has been found successful, in part, because feedback is immediate, which allows for interventions of new methods if the initial methods are unsuccessful (Briere, 1988). Data-based Precision Teaching helps the individual assess and evaluate the effectiveness of the instructional procedure. Precision Teaching allows one to determine whether an intervention is effective, whether it should be maintained, or whether it should be completely changed (White & Haring, 1980).
The purpose of this research was to determine the effectiveness of a timed Precision Teaching model teamed with the add-a-word program on spelling performance of an adult female graduate student.

Method

Subject and Setting
The subject was an adult female graduate student who, since elementary school, had difficulties with spelling and a phobia for timed tests. She carried a portable computerized spell checker that aided her in graduate school. The student was chosen as the subject because of her desire to improve her spelling performance. She felt daily timed testing might help her overcome her timed test phobia. This individual, was also a very hardworking and dedicated student, was very conscientious and wanted to remediate this difficulty.

The spelling procedures were conducted in her home where a relative administered the spelling assessments, while another person timed the one minute sessions. This work was performed at the kitchen table with a family member present. The family member was trained prior to the start of the project by the participant and served as intervention agent. This individual was employed for reasons of convenience.

Materials
The spelling words used in baseline and the add-a-word program were randomly selected from the Durrell Selected Vocabulary list (Durrell & Catterson, 1980) and a list of misspelled words from the subject’s daily work, such as terms like "acceleration aim" to "empirical." The words on each daily list contained a total of up to 119 letters.

Daily spelling words were listed vertically on spelling probe training sheets. In the upper left corner of the sheets, spaces were provided for the subject's name, the date, the timed period (one minute), the number of letters correct, the number of letters incorrect, and the total number of letters completed. A column containing the running total number of correct letters possible corresponding with each word was placed on the right side of the paper next to a column for actual completed correct letters. The training sheets were constructed with a column for the subject to copy words containing errors, cover the words, rewrite them, and compare them to the correct word (Murphy et al., 1986). A daily progress record sheet was used to record the correct letter count and the number of incorrect letters, the date, and a record of timing. This progress record sheet was used to keep a permanent record of the raw data and was later placed on a Standard Celeration Chart.

Movement Cycle
The behaviors measured during each daily assessment were the number of letters spelled correctly and the number spelled incorrectly per minute. The subject recorded spelling words on a sheet of paper as they were dictated to her. This exam was taken after the student had completed studying and practicing her list of words.

Experimental Design
An ABC single case design was used to provide data on the effectiveness of various procedures toward improving spelling performance. Reliability of measurement was not needed: as this was an instructional demonstration project similar to those used in quasi-experimental designs (Campbell & Stanley, 1966). Further, reliability is not commonly practiced among Precision Teachers due to the permanent products generated and daily charting of behaviors.

Baseline. During baseline, the subject formulated and studied three spelling word lists containing approximately 20 words with a total of up to 200 letters. The lists were studied for one week prior to the baseline assessment. Words on the list were studied through oral repetition and reviewed prior to the test. During the test, words were dictated to the subject for a one minute timed session. Three tests were administered over separate word lists on consecutive days. The number of correct and incorrect letters per minute were recorded and charted on Three-Cycle Chart. The Three-Cycle Chart was used during data collection because of the ease of charting, while the Six-Cycle Chart was employed later for ease of
interpretation and analysis. Aims were established and minimum celeration lines were drawn on the Chart as directed in White and Haring (1980).

**Add-a-word + Precision Teaching.** During this phase, new spelling words were placed on a flow, rather than fixed list. On a fixed list, the words remain the same even when mastery is achieved. On a flow list, after mastery, new words are added, and the words mastered are removed. Words that have been mastered reappear after five sessions to assess maintenance. The spelling words were practiced using the copy, cover, and compare method daily, for three days prior to the first test. After that, testing took place daily. When a word had been spelled correctly for three consecutive days, that word was dropped and another new word added. After five school days, previously correctly spelled words were again placed on the subject's list to assist in retention (McLaughlin et al., 1992).

During this condition, the subject was presented with up to 16 words, or 116 letters in a one-minute timed period. Spelling lists contained up to 18 words in the event the subject's speed increased. As in baseline, the number of correct and incorrect letters completed were charted. When the subject missed a word, she had to copy it from a correct model, cover, rewrite, and then compare her spelling to that on the list. This was repeated daily three times for each misspelled word daily.

**Add-a-word + Copying.** A new condition was introduced to the previous procedure when the subject's correct rate fell below the minimum celeration line for three consecutive days. To build speed, the subject copied each word on the list 10 times.

**Results**

The data indicate improvement in spelling performance with an add-a-word spelling program, when compared with a traditional study and oral repetition procedure used during baseline. During three baseline sessions, the median number of correctly written letters was 80, with scores ranging from 71 to 85. This was compared with the five sessions conducted during the Intervention I and Intervention II conditions (i.e., add-a-word and add-a-word + copying) resulting in median scores of 101 and 103, with ranges from 84 to 110 and 94 to 116 respectively.

Results from Chart 1 show an acceleration in correctly written letters and a deceleration in learning opportunities during the add-a-word and add-a-word + copying interventions respectively when compared with relatively level trends during baseline. The student's celeration on correct letters written was $\times 1.00$ during Baseline, while learning opportunities were $\times 1.10$. During Intervention I and II, respectively $\times 2.0$ and $\times 1.9$ celeration of correctly written letters, and $+ 8.00$ celeration of learning opportunities which remained below zero was observed.

**Discussion**

Results of this study indicate that add-a-word spelling procedures teamed with Precision Teaching were effective in significantly increasing the subject's spelling performance. These should be interpreted with some caution because there was no return to baseline. No definitive functional relationship between change in performance and various experimental manipulations was demonstrated. The effects of multiple treatments on the present outcomes cannot be ruled out. However, in a subsequent investigation, a partial component analysis could be conducted to replicate and verify the present results. Another experimental design that controls for the multiple treatment inference, such as a counterbalanced multiple baseline design or an alternating treatments design, (Kazdin, 1982) could also be used.

The individualized procedure was inexpensive. It involved extra effort to maintain the daily flow spelling list and to administer the daily tests. In most research involving the add-a-word spelling program, the number of words on the spelling list is reduced and testing is not timed (McAuley & McLaughlin, 1992; Pratt-Struthers, et al., 1983). The timing procedure
was difficult because the administrator occasionally said the words so fast the subject could not understand them. The subject did become more comfortable using a timed procedure and was pleased with the results of Precision add-a-word. More research might determine if the add-a-word procedure could be used successfully with larger lists of words.

References


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Computerized Learning of WordPerfect Using Precision Teaching

Kimberly P. Weber and Jim Cowardin

This study examined the time required to learn and the efficiency of learning WordPerfect 5.1 (DOS) commands using a computer-based course developed by Precision Learning Systems, Inc. The results showed that the subject was able to learn the course in less than four hours and was able to effectively use WordPerfect 5.1 after a total of ten hours of practice. Discussion examines the relevance of the skills taught and possible ways of improving the existing course.

Business, corporations, and technical schools spend significant amounts of time and resources teaching employees to perform specified services or tasks. Most often without the powerful technique of fluency development, a large amount of information is provided in a "show" rather than "do" style, usually in workshop or seminar format which does not emphasize skill practice. Employees may continue to acquire information by reading and rereading manuals or instructional materials that lack fluency building as a performance goal. Binder (1989) stated, "Most conventional training procedures and materials actually prevent or retard fluency in one way or another" (p. 17).

When skills are learned to "fluency" during training, they are immediately useful in everyday performance, and they endure even after a significant period without practice (Binder 1987, 1988; Haughton 1972). Johnson and Layng (1992) state, "fluency requires the skill to be available to the selecting environment as a behavior that can be readily linked or combined with other behaviors thereby allowing students to perform complex tasks and solve complex problems" (p. 1476). It can be summarized then that fluency has positive effects on both skill acquisition and generalization.

Domestic use and sales of personal computers have increased dramatically over the past ten years (Statistical Abstract of the United States, 1992). The number of personal computers sold in 1981 was 1.11 million and increased to 9.50 million by 1988. Computers used in the workplace increased from 1.24 to 20.53 million from 1981 to 1988. The educational system also increased its use of computers in schools from .13 to 2.36 million during the same seven year time period (Statistical Abstracts of the United States, 1992). With this increase in computer usage, it becomes important to find better ways (i.e., faster, better retention) to learn to use software programs.

There are numerous ways to learn software programs: manuals, workshops, tutorials, and knowledgeable friends or co-workers. These almost always require a significant investment of time. Some problems with these common methods, however, are low response frequency, unclear stimuli, ambiguous concept description, poor sequencing, and inefficient skill development.

Although there are general concepts involved in computer operation, each specific computer software program uses arbitrary system commands that evoke somewhat standard features. For example, many word processing programs have features such as moving, underlining, bolding text, but each program has its own series of key strokes to carry out these tasks. To "know" a program is to know--literally--which keys to press in certain situations to access features of the software. Most computer training focuses on the function and capabilities of the software, but neglects to assist the trainee in mastering the "mechanics" of operation. Consequently, the product of much computer training is a vague understanding of the features.
with low fluency in the skills with which to access them. It is left to the trainee to learn to operate the system by reading the manual and slowly becoming fluent in the system's command process (i.e., keystroke combinations). Learning from typical resources (e.g., manuals) is slow for all and nearly impossible for others. A process that would bring a trainee to fluency in essential skills quickly and efficiently would be a useful addition to training. It is this goal, skill development, that the Precision Learning System (PLS) course is designed to meet.

This paper demonstrates that information required to run WordPerfect (WP) 5.1 can be learned quickly and retained over extended periods of time as a result of fluency building exercises. How quickly fluency was built with one adult learner will be shown. Extensions of these skills to the practical aspect of operating the software successfully will be discussed.

**Method**

**Participant**
The subject was the first author, Kimberly, a twenty-eight year old Ph.D. trainee at The Ohio State University. Her exposure to WordPerfect (Version 5.1) through a two hour training session approximately eleven months prior to the study was minimal and insufficient to develop skills or maintain retention. The subject did have general knowledge about computers and word processing programs prior to the study. She was able to use two other word processing programs, First Choice and Professional Write, for IBM compatible systems and one word processing program, Microsoft Word, used with Macintosh computers.

**General Description and Operation of Precision Learning System.** The Precision Learning System (PLS) course is a computer-based learning program modeled after (SAFMEDS) Say - All - Fast - Minute - Every - Day - Shuffle (Lindsley, 1980; Potts, Eshleman, & Cooper 1993). To begin use of the Precision Learning System course, the learner selects a module, enters the number of minutes (time interval) she or he would like to spend studying the set of questions and signals the program to start. The program then simultaneously randomizes the order of questions in the selected module, presents the first one, and begins counting down the time. The learner reads the first question and responds to stop the clock. The system then evaluates the answer, gives feedback on accuracy of the response, and waits for the learner to press a key before showing the next question and beginning the process again. This cycle is repeated until there is no more time left, or until all questions have been answered. Most modules contain a range of thirty to sixty questions. During the trial, the Precision Learning Systems software records the number of correct and incorrect responses the learner has given, computes percentage correct, number of correct answers per minute, and displays the results. Since the timer turns off and on during practice trials, the program is actually recording response latencies, the interval between the moment the question appears on the computer screen and the instant the response is made. "Counts per minute" is actually a calculation of average latency. After completing the session, the learner can review the questions missed, run the same module again, choose another module, or quit the program.

**Description of WordPerfect Course.** The course contains one lesson with four modules. Module One consists of fifty-five questions, of which fifty-two are key stroke combinations, two are True/False questions, and one requires a single digit number. For the key stroke combinations, the subject must press a function key either alone or along with the Shift, Control, or Alt key simultaneously (i.e., Shift-F1 or Alt-F3) to obtain a correct response. Module Two contains sixty questions; fifty-nine of which require key stroke functions, and one is a three letter character string. Module Three has forty-eight questions; forty-seven are key stroke combinations, and one is a single letter. Due to the limited number of questions in Module Four, it was not included in this study.

**Procedure**
The subject used the Precision Learning Systems course as the sole method for learning during the study. The subject completed a
maximum of four trials per day, per module, until an instructional aim of at least twenty correct responses per minute and a maximum of two incorrect responses per minute was attained. The modules were run on a 286 IBM compatible PC in the subject's home. She did not use the actual word processing program until completion of the study.

Sessions. The subject only practiced Module One during the first week. At the beginning of the second week, the subject started Module Two and continued building fluency on Module One. During the end of the second week, the subject did one sprint with Module Three and then did not use it again until the end of week three. During week three and four, all of the modules were run at least one time. During week five, none of the modules was run. The sixth week, the subject reviewed all the modules.

Maintenance Assessments. Two weeks after reaching the instructional aim, maintenance assessments began and continued intermittently over the next seven weeks. To examine the effects of maintenance assessments on fluency, schedules were varied across modules. Module One was run one time per day for three continuous days, and Module Two was run two times per day for four consecutive days. The second assessment for maintenance began on May 31, 1993 for Modules One and Two. Module One was completed two times per day for four continuous days, while Module Two was run one time per day for seven days over an eight day time period. The only maintenance assessment completed for Module Three began over five weeks after the original completion of the study. Module Three was run one time per day for twelve consecutive days.

Results

Performance on the modules are independent data sets, since the content for each module is unique.

Module One

The instructional aim (20+FC; ≥2FIC) for Module One was reached after ten days (trials occurred on six of these days), sixteen counting periods, and a total of sixty-seven minutes of clock time. The celeration for corrects was x4 and for learning opportunities was +5. After reaching aim the first time, three days lapsed before the next session. On subsequent days, performance would start out slightly below aim, but on the second session during the same day the score was consistently either at or above aim. Typically there were five to six days between sessions after reaching instructional aim the first time. The highest score in Module One was twenty-eight corrects per minute without any learning opportunities.

Module Two

Aim for Module Two was reached after twenty-nine days (eleven days on which sessions occurred), twenty counting periods, and a total of seventy-eight minutes clock time. The overall celeration for corrects was x1.5 and +1.8 for learning opportunities. After reaching aim the first time, the subject went below aim only one additional time during the study. The highest score was twenty-four correct per minute without any learning opportunities.

Module Three

Aim for Module Three was reached after nineteen days (six days of which sessions occurred) eleven counting periods, and a total of thirty-five minutes of clock time. The overall celeration was x1.4 for corrects and +2 for learning opportunities. The high score for Module Three was twenty-three corrects per minute without any learning opportunities.

Assessment Maintenance Data

Module One. Two different sets of maintenance data were conducted on Module One. During both assessments the subject never fell below aim. The first set of maintenance data was arranged with the subject completing one session per day for three consecutive days. The first trial was above aim with twenty-one correct per minute and .4 learning opportunities per minute. The highest score for the first maintenance set was twenty-eight correct per minute without any learning opportunities.

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The second set of maintenance data lasted for four continuous days with two sessions each day. The first session the subject scored twenty-two corrects with 1.3 learning opportunities per minute. The highest score for the second maintenance set for Module One was forty corrects per minute without any learning opportunities.

Module Two
Two different sets of maintenance data were collected for Module Two. The first maintenance set lasted for four continuous days, containing two sessions per day. Both sessions on the first day of maintenance data were below aim. On the second day, the second trial was above aim at twenty-one corrects per minute with two learning opportunities per minute. On the final day of the first maintenance set, the highest score (e.g., thirty-two corrects per minute with .5 learning opportunities per minute) was attained.

The second maintenance set was completed one time per day for seven days over an eight day time span. Only once during the second maintenance set did the subject score below aim. The highest score during the second maintenance set was the last trial with a score of thirty-two corrects per minute without any learning opportunities per minute.

Module Three
Approximately five weeks after the study was completed, one maintenance assessment was completed for Module Three. The assessment lasted for twelve consecutive days with the subject completing one session per day. The first three sessions fell below aim, while the last nine sessions were all above aim. The lowest score in the nine sprint span was twenty-one corrects per minute with one learning opportunity per minute, and the highest was thirty corrects per minute without any learning opportunities per minute.

Discussion
Celerations for the modules range from x1.4 to x4 and +1.8 to +5. This range may be due to the subject skipping only one day a couple of times before reaching the instructional aim in Module One (showing higher celerations), while in Modules Two and Three, the subject skipped many continuous days over several weeks before reaching the instructional aim (showing lower celerations). If the number of counting periods and total time required to meet aim is compared by modules, the results are relatively close in all three modules. The counting periods ranged from eleven in Module Three to twenty in Module Two. The total time ranged from thirty-five minutes in Module Three to seventy-eight in Module Two. Of the three modules, Module Three required the least amount of counting periods and the least amount of actual time to reach the instructional aim. This may be because Module Three contains fewer questions than the other two modules.

The total amount of time spent on the three modules combined was three hours and ten minutes, not including maintenance data. This is an extremely short amount of time to become fluent on such a large and detailed amount of information. The subject, however, spent additional unrecorded time reviewing incorrect responses at the end of some sessions. After completing a timing session, the computer allows an option to review missed questions from the last session, with feedback on each response but without timing or data collection. The learner was able to take as much time as necessary to read and respond to the questions. When the subject was first learning the key stroke combinations and functions, the review sessions took longer. This may have been due to the large number of questions that the subject scored incorrectly and to reading the questions slowly before responding. The learner reviewed answers approximately half of all opportunities.

The PLS course not only provided the subject with the function key combinations to do specific procedures in WordPerfect (WP) 5.1 (i.e., centering (Shift-F6), spell checking (Cntl-F2), saving the program (Fl0)), but it also provided practice in the actual motor skills required to perform those functions.

Prior to completion of the course, the subject had never successfully operated WordPerfect 5.1. After completing the PLS course, the learner practiced using WP 5.1 for approximately an hour and pressed all of the
function keys to see exactly what would transpire on the screen. This first session was very slow and awkward, as might be expected. After another two hours of familiarization, the subject was able to operate the most frequently used function keys precisely without hesitation. Since learning WP 5.1 using the PLS course, the subject's use of WP 5.1 has been sporadic (e.g., periods up to one month without using WP 5.1). However, the learner has maintained mastery of the keystroke commands.

The use of the PLS course to learn WP 5.1 has many benefits in convenience, efficient learning with retention, and mastery of features. For convenience, the subject was able to practice the modules inconsistently (skipping several days between sessions) and was still able to learn the modules in a very short time. The program was used at varying times of the day or night in the subject's home on her own personal computer. The amount of time set for each session can be changed to as little as one minute and as long as thirty minutes, although the recommended time for a session of this type is five minutes. Efficiency of the PLS course allowed the subject to learn the course in a little over three hours with almost full retention of skills after two weeks without using the course. These skills have continued to allow the subject to successfully use the WP 5.1 program without use of the PLS course for approximately one year.

Improvements
As this was the first complete controlled "field test" of the program, several suggestions for improvement of the PLS program are presented. In the future, the program might change the order that the functions are taught. Currently, the course presents in Module One functions involving the F1 - F3 keys, Module Two, F4 - F6 keys, and Module Three teaches F7 - F8 keys. This arrangement teaches some functions that are not needed in basic document preparation. A better format may introduce more important commands first and leave others to later optional modules. For example, the List function (F5) is used frequently and should be in the first module, while the Macro function (Alt-F10), which is not frequently used, could be placed in a later module which the trainee may or may not wish to master.

In this study, the program included functions related to function key commands. It excluded other pertinent information about the application such as navigational information of WordPerfect 5.1. Some examples of the navigational keys are the home, page up, page down, the arrow keys, insert, and the end keys. Since the conclusion of this study, additional modules to address the navigational keys have been added.

Limitations
In working with computers, a combination of fluency building exercises along with informational sessions may provide the best training. An individual might use the PLS Course until fluency is reached and then attend an instructional session or workshop where the applications of the program are discussed. Precision Learning Systems has found this sequence, fluency on the basics first, followed by a presentation, to work very well on other subjects. At the informational session, additional practice with the actual program used could be provided, in a controlled setting, with immediate assistance as needed. This would allow the learner to combine fluent tool skills in more complex operations.

Conclusion
The total time needed to learn WordPerfect 5.1 fluently was approximately ten hours. Three hours were spent working on the PLS course, approximately four hours were spent on review sessions, and another three hours were spent exploring WordPerfect 5.1 and becoming completely comfortable using WordPerfect. The time spent to become familiar with WP 5.1 was very short considering the large amount of functions which needed to be mastered before the WordPerfect could be used fluently. Future research could directly compare another mode of learning WP 5.1 to the PLS course. For example, subjects might be assigned to either the PLS course or a daily workshop. Assessments of performance would be taken after the completion of each day's requirements
from the different treatment types. An additional extension might be to combine two different techniques to see what results would be produced.

Benefits of the PLS course include learning efficiency. The course provides adequate amounts of fluency building exercises for the subject to function quickly and precisely in the WP 5.1 program after less than four hours of study. The text portion of this manuscript was completed by the subject using WordPerfect 5.1.

References


Kimberly P. Weber is a Ph.D trainee at The Ohio State University, and Jim Cowardin is affiliated with Precision Learning Systems, Inc. 1488 West Lane Ave., Columbus, OH 43221.
CALENDAR WEEKS

6 CYCLE - 140 DAYS (20 WKS)
BEHAVIOR RESEARCH CO
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SUCCESSIVE CALENDAR DAYS

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SUPERVISOR    ADVISER   MANAGER
Precision Learning Systems

Computer
TIMER

Computer
COUNTER

Kimberly Weber
BEHAVIOR

28
AGE

Adult LABEL
see-do
COUNTED keyboard strokes
(Module 2)
Reducing Negative Inner Behavior of Senior Citizens: The One-Minute Counting Procedure

Richard M. Kubina, Jr., Manfred W. Haertel, John O. Cooper

This study assessed the effects of a one-minute counting procedure on reducing negative inner behaviors of two female senior citizens, aged 88 and 83. Both participants showed a relationship between the one-minute counting procedure and a jump-down in frequency of negative inner behavior, and they believed our procedures were easy to use and time efficient.

The number of people aged 65 years or older in the United States is projected to reach nearly 22 percent of the population by the year 2030 (U. S. Bureau of the Census, 1989). Personal and societal concerns will likely accompany the growing number of senior citizens, and basic issues such as health care, housing, finances, and independence could occasion accelerated personal negative thoughts and feelings (Burns & Kamerow, 1988; Doolin, 1986; Holden, Burkhauser, & Meyers, 1986; Keigher & Greenblatt, 1992; National Center for Health Statistics, 1989). Many of these issues need political and medical intervention, but instruction may help some troublesome areas.

The gerontological literature (e.g., Stacey & Gatz, 1991) devotes considerable attention to psychological well-being, often viewed as a balance between negative and positive affect. Since Bradburn (1969) formulated the idea of balancing negative and positive affect, many research projects measured, described, and compared this state of well-being (Diener & Emmons, 1984; Lawton, 1984; Lawton, Kleban, Dean, Rajagopal, & Parmelee, 1992; Watson, Clark, & Tellegen, 1988).

Several researchers described negative and positive thoughts and feelings as inner behavior, sometimes called private or covert events (Moore, 1980), and used self-recording and positive practice to balance negative and positive affect (e.g., Calkin, 1981, 1992; Cooper, 1991; Conser, 1981; Duncan, 1971; McCrudden, 1990). During a typical one-minute counting session, an individual thinks of as many positive personal thoughts and feelings as possible (Calkin, 1981); examples would be: "I am intelligent," or "I am attractive," and so forth. With practice, most people will think and self-record 30 to 50 positive thoughts and feelings per minute, often resulting in an overall daily reduction in negative inner behaviors. Elementary students, college students, and middle-aged adults have used this terse self-management procedure successfully (Calkin, 1992; Conser, 1981; Cooper, 1991; Duncan, 1971; McCrudden, 1990).

We found no studies using the self-management procedure of self-recording and positive practice with persons who are elderly. Our study is a systematic replication of Calkin's (1981) self-management method, with elderly persons serving as participants. These participants self-‐recorded positive thoughts and feelings daily during a one-‐minute counting period. Our goal was to improve the balance between positive and negative thoughts and feelings of elderly persons reporting troublesome inner behavior, and to provide another data source for establishing the generality of Calkin's 1981 procedure.

This report is based on a thesis submitted by the first author in partial fulfillment of the requirements for the Master of Arts degree at The Ohio State University and was supported in part by a Leadership Training Grant (#H029D10054) from the Office of Special Education Programs, U.S. Department of Education. Address correspondence to John O. Cooper, Applied Behavior Analysis, The Ohio State University, 356 Arps Hall, 1945 N. High St., Columbus, OH 43210.
Method

Participants
The participants in this study were 2 female senior citizens, aged 88 and 83. We selected these participants because they reported troublesome negative thoughts and feelings such as loneliness, depression, sadness. Also, they were free of mind-altering diseases (e.g., Parkinson’s, Alzheimer’s), possessed hand dexterity sufficient to operate a wrist counter and use a pencil to mark a sheet of paper, and had sufficient visual acuity to discern lines on the Standard Celeration Chart (Pennypacker, Koenig, & Lindsley, 1972).

Setting
We held the initial meeting, instruction, and subsequent follow-up meetings in a large conference hall that accommodates 75 people, located on the second floor of the senior citizens' apartment building. There were four, 6 ft x 4 ft tables, and approximately 35 chairs in the area. This setting was convenient because of the central location. The actual research setting for the occurrence of inner behaviors was anywhere that the participants were when they recorded the occurrences of inner behaviors.

Definition of the Target Behavior
The target behaviors of this study were negative feelings or thoughts. We defined a negative feeling as an individually perceived emotional state of a dissonant or otherwise uncomfortable emotional tone. To respect the individuality of each participant, these, and any other feelings or thoughts that the participant discerned as negative, were included. Some examples of possible negative feelings included sadness, gloom, despair, and helplessness. A negative thought was an idea or similar consideration that was self-observed as negative (e.g., “I don’t think anyone cares for me; I hate when that happens”). Again, specific to the individual, a thought that was negative to one person may not have been negative to another. The negative thought response class varied among, and was particular to, each participant.

Measurement
The participants attached a wrist counter (i.e., a golf score counter) with a watch band to their wrist and made a tally of each perceived negative feeling or thought by pushing the counter button, producing a cumulative number on the face of the wrist counter. The tally denoted perceived events. At the end of the counting period, the participants recorded the cumulative total number of perceived negative thoughts and feelings on a piece of paper. At the end of the week, Rick, the first author, went to the home of the participants, collected their cumulative totals, and displayed those data on Standard Celeration Charts.

Procedures
Before. The Before Phase consisted of either 8 days of observation, or as many additional days as needed to establish steady frequency of responding. We defined steady state responding as a weekly celeration that is \( x \times 1.1 \) or \( +1.1 \) (i.e., multiplies or divides by 1.1). The target behaviors were defined for the participants as negative thoughts and feelings (as explained above) that occurred during each 24-hour counting period. Further, we presented the participants with examples of occurrences and non-occurrences of negative thoughts and feelings, and explained that when they perceived a feeling or thought that had a negative, or dissonant feeling or tone, it was an occurrence of the target behavior. A non-occurrence was a feeling or thought that was positive, pleasant, or otherwise connoted as a happy feeling or thought. Next, we instructed the participants to push the button on their counters when they perceived a negative thought or feeling, or when they perceived that a negative thought or feeling had occurred. The next morning they recorded the cumulative wrist counter total on a data sheet when they awoke, and reset the counter to start a new counting period.

During the one-minute counting period. We introduced the participants to the one-minute counting period for positive thoughts and feelings following steady state responding in the before phase. The one-minute counting period occurred daily and accompanied the procedures used in the Before Phase. During one-minute counting periods, the participants quickly
thought and tallied as many positive thoughts and feelings as they could in one minute.

Participants used the think/mark learning channel to tally the thoughts and feelings. The think/mark channel describes the sense modalities participants used. With the think/mark channel, they "think" of positive events or occurrences, and "mark" the thoughts by making one tally on a tablet, or piece of paper, for each positive event perceived. The participants started a timer to begin the one-minute counting period, stopped counting when the timer signaled the end of the counting period, and then recorded the cumulative tally of positive thoughts on a piece of paper. Rick later displayed the cumulative daily tallies on Standard Celeration Charts.

Results

Charts 1 and 2 show the count of negative inner behaviors during the Before Phase and when the one-minute counting period was in effect for each participant, as well as the count of positive inner behavior during the one-minute counting periods. These data present fewer all day counts of negative inner behavior for both participants when the one-minute counting period was in effect, and an acceleration of positive thoughts and feelings across the one-minute counting periods.

Participant 1. Chart 1 shows the Before Phase of 8 days of steady state responding for the first participant's negative inner behavior. The Before Phase had a frequency spread of 6 to 12 occurrences per day and a celeration value of x1.0. The During Phase was 17 days of data occurring, while the one-minute counting period was in effect. Negative inner behavior had a frequency spread of 0 to 8 occurrences per day, and a celeration value x1.0. A jump-down occurred between the Before and the During phases, with a frequency change of +1.9.

The other feature to analyze on Participant 1's Standard Celeration Chart is the data from the one-minute counting period. Seventeen days of the recorded occurrences of positive thoughts and feelings spread from 6 to 18 in a one-minute interval. The celeration value of positive thoughts and feelings multiplied by 1.5 in the During Phase.

Participant 2. Chart 2 shows the Before Phase of 11 days of steady state responding. The Before Phase had a frequency spread of 6 to 14 occurrences per day and had a celeration value of x1.0. The During Phase was 13 days of data occurring, while the one-minute counting period was in effect. Negative inner behavior had a frequency spread of 3 to 9 occurrences per day, and a celeration value x1.0. Again, a jump-down occurred between the Before and the During phases, with a frequency change of +2.

In the During Phase, 14 days of the one-minute counting period, positive thoughts and feelings of Participant 2 had a frequency spread of 5 to 19 occurrences per one-minute counting period. The celeration value of positive thoughts and feelings in the During Phase multiplied by 1.8.

Discussion

In our study, changes in negative thoughts and feelings jumped-down in performance frequency, supporting Calkin's 1992 finding that her procedure for one-minute counting periods has the greatest effect on the frequency, not celeration, of inner behavior. Weekly celerations, however, identified changes in the positive thoughts and feelings. Also, Calkin (1992) found that the "frequency envelopes" for inner behaviors tend to be broader than for public behaviors. We also found inner behaviors to have broad frequency envelopes, again supporting Calkin's findings.

The participants completed a verbal exit interview, giving them an opportunity to tell us their views on our methods, and we recorded the participants' responses. The exit interview contained no negative responses, nor were there negative responses during the study. Both participants stated that they enjoyed using the one-minute counting procedure and that the outcome was helpful. One participant described the one-minute counting procedure as "... a little to get a lot"; that is, the time put into the method, one-minute a day and approximately another ten minutes a day to record inner behavior, was very small for the outcome--a
meaningful reduction of negative inner behaviors. One of the participants noted that she did her one-minute counting period at the beginning of the day, believing it set a positive precedent for the rest of the day. Another common notion shared by the participants was that they became more aware of events that tended to be antecedents to negative inner behavior. They both also expressed that this method would be ideal for "...old folks who just sit around all day and do nothing." They believed our procedures were easy to use and time efficient.

Limitations. This study had several limitations. First, the participants in Calkin's (1992) research assessed the effects of the one-minute counting period on both positive and negative thoughts and feelings, and found the procedure more effective with positive thoughts and feelings than with the negative. Participants in our study only recorded the effects of the one-minute counting period on negative inner behavior. Therefore, we did not investigate positive inners, what Calkin found most influenced. Even though the participants stated that they were having more positive thoughts and feelings in the exit interview, without direct measurement of these inners to support that claim we can not determine that the one-minute counting period did function to increase positive inners. Participants in our study only recorded the effects of the one-minute counting period on negative inner behavior. Therefore, we did not investigate positive inners, what Calkin found most influenced. Even though the participants stated that they were having more positive thoughts and feelings in the exit interview, without direct measurement of these inners to support that claim we can not determine that the one-minute counting period did function to increase positive inners. Replicating this study with the added dimension of charting positive inners will help to increase the generality of the one-minute counting period. Second, Calkin (1992) suggested that inner behavior analyses should be a minimum of 5 weeks in duration. Perhaps with this time allotment, negative inner behavior would jump-down to lower frequencies than reported in our study. Third, our participants did not set a specific frequency aim (e.g., 0 to 3 negative thoughts or feelings per day) besides a general reduction of negative inners. Finally, we did not assess retention of the reduction of negative inner behaviors.

Future Research. Skinner wrote much on the inclusion and acceptance of inner behavior in a natural science of behavior. Many behavior analysts, however, still view inner behavior as something like a hypothetical construct, believing that inner behavior is beyond the realm of scientific study because there can be no interobserver agreement. Skinner (1953, 1964, 1974) repeatedly made statements to allay this concern:

No entity or process which has any useful explanatory force is to be rejected on the ground that it is subjective or mental. The data which have made it important must, however, be studied and formulated in effective ways. The assignment is well within the scope of an experimental analysis of behavior, which thus offers a promising alternative to a commitment to pure description on the one hand and an appeal to mentalistic theories on the other. (1964, p. 96).

The research done in Precision Teaching with inner behavior succinctly follows Skinner's appeal. Research on inner behavior has not received the attention it deserves. The dramatic results it has attained imply that the behavioral community will benefit greatly from improving inner behavior research methods, such as the one-minute counting period.

Skinner (1974) maintained that a behavioral analysis does not reject any of the "higher mental processes," but is indeed at the forefront of determining their nature. Charting and applying measurably effective methods such as Calkin's one-minute counting procedure to affect inners will extend behavioral analysis to inner behavior.

Skinner stated:

What a person feels is a product of the contingencies of which his future behavior will also be a function, and there is therefore a useful connection between feelings and behavior. It would be foolish to rule out knowledge a person has of his current condition or the uses to which it may be put.... In casual discourse the limits of accuracy.... are not necessarily serious, but we can nevertheless predict behavior more accurately if we have direct knowledge about the history to
which feelings can be traced. (1974, p. 230).

Charting inner behavior provides a permanent historical record of a direct frequency count of a person's perceived thoughts and feelings. We need further research on the experimental control over inner behavior. A future research project could address the relation of studying the effects that inner behavior change has on public behaviors.

Other suggestions for future research with inners follow. Calkin (1992) stated that the effect of frequency, not celeration, growth of inner behavior is a question for future research. Does this occur because of "project supervision" or some other unforeseen variable? Does this phenomenon occur with other inner behavior? We need to address all of these questions in the further research of inners. We need to include more and different age and cultural groups as participants to extend the study of inners. Currently, research indicates that the one-minute counting period is effective for diverse age groups, but we need further research and replications to expand the body of proof. We need to also determine the effects of the one-minute counting period for different pinpoints (e.g., anger management, weight control, smoking cessation). Educators and social scientists use public interventions to change behavior related to dieting, smoking, fighting, and so on. Affecting these troublesome behaviors by inner behavior management may be one buttress towards the validity and inclusion of the study of inner behavior as natural science. As a last suggestion, we may need to determine what collateral public behaviors accompany the use of the one-minute counting period. Another way to validate the one-minute counting period is to count simultaneously some external behavior that relates to the inner behavior, but determining the effects of an inner behavior intervention by counting external public behavior is indirect measurement.

Summary
This study sought to determine the effectiveness of a one-minute counting period with two female senior citizens, aged 83 and 88, who daily, self-recorded perceived occurrences of negative inner behavior. In the Before Phase, participants only tallied negative inner behavior. Following the Before Phase, they reduced negative inner behavior by tallying as many positive thoughts and feelings they had during a one-minute interval of time. Our results correlated the one-minute counting period with the reduction of negative inner behaviors for both participants. During an exit interview, the participants said they enjoyed using the procedures, and that they believed these procedures would benefit other senior citizens as well.

References


Camelot's First-grade Reading Pilot: Report of Performance and Learning Effects from Three Years of SBG's World of Reading with the '93 Class Enhanced by SRA's Reading Mastery, Fast Cycle III/II and Precision Teaching

Malcolm D. Neely

This paper reports reading results for three years of Camelot Elementary School's first-grade curriculum, instruction, and practicing. It reports the measurement of pupils' performances and learning rates that are curriculum-based and outcome-based measurement. Learning pictures on Precision Teaching's Standard Monthly Learning Charts compare performances and learning rates of three Camelot first-grade years, '90-91, '91-92, and '92-93. The '90-91 first-grade pupils received instruction from the Silver Burdett-Ginn World of Reading series, only. The '91-92 pupils received instruction from the SBG World of Reading with the most at-risk receiving additional Precision Teaching practice and chart viewing. The '92-93 class included two instructional groups. One group with 11 pupils who could already read or had mastered their reading readiness skills continued to receive SBG's World of Reading instruction, only. This report excludes that data. The second group of 44 pupils received instruction from Science Research Associates Reading Mastery, Fast Cycle III with additional Precision Teaching practice and Chart viewing. All three years experienced language arts skill development with whole language concepts and SBG World of Reading materials. The median test with both Fisher's exact and chi-square probabilities determined the significance of differences between the distributions of each year's pupil performances and learning rates. Major conclusions are: (a) Reading Mastery and Precision Teaching combined to produce faster '92-93 fluency development (x1.8 and x2.0). (b) Reading Mastery and Precision Teaching combined to produce faster '92-93 accuracy development (x1.8). (c) Precision Teaching assisted in faster '91-92 at-risk pupils' fluency development (x1.4). (d) Teachers are not the cause of faulty reading development; faulty curriculum, instruction, and measurement designs are. Additional conclusions and recommendations are discussed.
is largely due to a federal housing project nearby. Camelot's current 380 student enrollment is declining due to the aging of the surrounding community. Once the school year begins, enrollment remains fairly steady. A Primary Intervention Program (PIP) for counseling K-3 pupils-at-risk, a building counselor for others, and the principal, all address Camelot's pupil and parent social problems. The Camelot community makes a very positive and pleasant school in which to learn and work.

Previous reading programs, phonics-based and linguistic-driven Economy Keys to Reading, and the more recent reading program, sight-based and whole language driven SBG's World of Reading, produced a 30 to 50% Camelot population eligible for Chapter 1 reading service consideration. Those numbers equaled enough reading problems to justify a teacher for Chapter 1 pupils along with two teaching assistants, and a resource room teacher and assistant.

Two years of fluency data and continued teacher dissatisfaction still indicated too many pupils with poor reading skills. Review of the literature showed a need for a different curricular and instructional design than the previous attempts. Camelot's Chapter 1 Steering Committee decided to focus on the first grade where reading development is most crucial, rather than to continue "bandaidding" with limited Chapter services across the grades as before.

SRA's Reading Mastery Fast Cycle III was the reading program chosen to address Camelot's reading development problems. Reading Mastery Fast Cycle III was to supplement SBG's World of Reading instruction for those youngsters found to be at-risk. Chapter 1 and Individualized Educational Program (IEP) criteria defined the at-risk pupils. Representatives from the District's Educational Support Services Division met with Camelot's Principal, Phyllis Tellari; First-Grade Teachers, Carol Pardue and Theona Wall; and Support Staff, Malcolm Neely, Donna Luchs, and Carol Zuck. The District approved Camelot's piloting the Reading Mastery Fast Cycle III supplemental program beginning with the 1992-1993 school year.

**Procedure**

**Previous programs**

Three Camelot teachers taught fifty '90-91 first-grade pupils reading instruction in three rooms for 60 to 75 minutes each day. They used SBG's World of Reading and whole language approach, only. A Chapter 1 teaching assistant pulled 15 at-risk pupils into groups of three to five, for 15 minutes of additional instruction each. The pupils tried to reread the story of the day.

Two Camelot teachers taught fifty-seven '91-92 first-grade pupils reading instruction in two rooms for 60 to 75 minutes each day. They also used SBG's World of Reading and whole language approach. As before, the Chapter 1 teaching assistant pulled 15 at-risk pupils into groups of three to five for 15 minutes of additional instruction. Again, the pupils tried to reread the day's story. There was, however, an add-on assistance technique. Forty-four of the fifty-seven students received additional practice through two or three one-minute daily practice projects during the first three-and-a-half months when one to three parent volunteers assisted an hour-and-a-half per day of additional Chapter 1 help. As the volunteers decreased for various reasons, only the least skillful pupils continued to practice and Chart view.

**New program**

A changed population -- a population with even more challenges than previously considered, met Camelot's "new program." Replacing its usual population were 11 Ukrainian children, one Pakistani child, one Korean child (all English as Second Language (ESL) defined), and twins with IEP's from Special Education's pre-school program. Moreover, a greater number of the rest of the September first-graders showed lower reading readiness skills. Of the 55 first graders, 44 pupils fell within the criteria defining Camelot's at-risk. Had any of these 44 children entered Camelot School in previous years, they would have been eligible for its Chapter 1 support services.

The pilot program for '92-93 consisted of two Camelot teachers teaching in two rooms 52 to 55 first-grade pupils reading instruction from SBG's World of Reading and whole language
approach with two additional assist techniques. Forty-four pupils received daily 60 to 75 minutes of SRA's Reading Mastery Fast Cycle III instruction from the teachers and three assistants, as well as up to five, daily, one-minute practice projects.

Three Reading Mastery groups and one World of Reading group comprised each classroom. The classroom teacher taught her World of Reading group on Mondays and Fridays and traded with each assistant-taught Reading Mastery group during the mid-days. That way the teacher kept informed with the program and progress of all her pupils, and practiced Reading Mastery teaching techniques.

While the team was in one first-grade classroom, the other classroom teacher taught reading and language arts development using whole language techniques with the World of Reading first-grade materials. The teacher used the DISTAR Library and Reading Mastery spelling portion, also. Each classroom alternated Reading Mastery instruction between 9:30 to 10:45 and between 1:15 to 2:15 every other day. That way each class received five morning and five afternoon Reading Mastery Fast Cycle III and World of Reading instructional days in a ten day period.

Grouping considered both classrooms as one. Camelot's first grade had six Reading Mastery Fast Cycle III groups and two World of Reading groups. Neither Reading Mastery I nor Reading Mastery II was available to the team, only the Fast Cycle series. In the beginning, ten or eleven children were not in their home-rooms. After repeated regroupings, 20 or more pupils exchanged rooms for reading or language instruction. With so much interchange, progress report writing demanded a team effort.

Training. Science Research Associates sponsored a Direct Instruction Workshop in Bellevue, Washington in August 1992. Two staff members had some experience with Reading Mastery Fast Cycle III. Two members had little or no exposure to the program. One teacher was unable to attend the workshop. She received help from those who attended and who had some experience. With SRA's Representative Neil Schroeder's help, SRA also sponsored Molly Olson, a well-qualified DI Trainer, to provide the staff with follow-up training four times during the year. In addition, the District bought training tapes (J/P Associates, Inc.). Staff members used the tapes to study, compare, and improve their skills using Reading Mastery Fast Cycle III.

Measurement. Reading Mastery Fast Cycle III provides for small segment testing by small group unison and individual response as an integral instructional design. [Periodically Reading Mastery Fast Cycle III individually tests after a day's lesson.] Lastly, Reading Mastery Fast Cycle III provides pencil/paper tests after 20 lessons.

Precision Teaching techniques supplied additional decision making data from practices designed for firming and fluency building. Pupils said their Reading Mastery orthography sounds from SAFMEDS (Say-All-Fast-Minute-Every Day-Shuffle) and from a practice sheet, and read their Reading Mastery words from seven practice sheets composed from eight stories spaced throughout the Fast Cycle III series. The adults charted each pupil's performances on the Standard Daily Learning Chart (Behavior Research Company). The seven, one-minute-tests were:

1. see mixed upper and lower case letters, and say the letter names;
2. see lower case letters, and say the letter sounds;
3. see all 50 World of Reading Readiness and Level-1 words, and say the words;
4. see all World of Reading Readiness words in sentences, and say the words;
5. see World of Reading 34 Critical plus one Support Level-2 words and 35 Critical plus two Support Level-3 words, and say the words;
6. see World of Reading 42 Tested plus two additional Critical Level-4 words and 31 tested plus 13 additional Critical Level-5 words, and say the words;
7. see World of Reading's "A New Day in the City" Level-5 story, and say the words.

The 16 readiness words introduced in kindergarten and 23 family member words made the ten sentences that test kindergarten word fluency. Some sentences came from the SBG's World of Reading Placement Test; we invented the other sentences.

"A New Day in the City" comes late in the first-grade World Of Reading reader. Because of the story's inclusion in the first-grade reader, one assumes the story to be less than grade-two reading difficulty. Microsoft's word readability formulas, Flesch-Kincaid and Flesch, indicate readability levels from 2.8 to 6.0. Unreliable readability formulas prevent discussion of grade-level attainment. However, since the tests for all three years used the same passage and words, we can compare performances and progresses.

Neely's interest in effective educational measurement led to the test materials and testing in '90-91 and '91-92. Fortunately, the data were available for decision making and subsequent comparative data when the '92-93 year allowed change and comparison. The tests measure pupil performance and learning for each part. Pupils take one minute for each part. Neely charted the results on Standard Monthly Learning Charts to show monthly performances and half-year learning rates.

Neely compared the SBG Progress-Check timed tests with the Reading Mastery Fast Cycle III reading program to be sure that what was tested was taught. The word comparison of the World of Reading progress-check words and the Reading Mastery Fast Cycle III words showed 82% agreement. When the pupils completed lesson 170 in Reading Mastery Fast Cycle III, the pupils practiced 345 of the 420 representative World of Reading critical, support, and story words found in the progress checks. Most Progress-Check tests had more sounds or words than pupils could respond to within the allowed time. Pupils stopped reading when the timer signaled the minute's end. As pupils got faster, they completed the tests in less time than one minute. The adults who were testing instructed the pupils to start over from the top and continue until the signal sounded. The adults were the support staff, parents, student-teachers from state universities, and teachers freed by their student-teachers. A group of fifty-some youngsters showed their seven, one-minute skills to between six and nine recorders within 70 to 90 minutes of listening. Neely's interest in effective educational measurement led to the test materials and testing in '90-91 and '91-92. Fortunately, the data were available for decision making and subsequent comparative data when the '92-93 year allowed change and comparison. The tests measure pupil performance and learning for each part. Pupils take one minute for each part. Neely charted the results on Standard Monthly Learning Charts to show monthly performances and half-year learning rates.

While important to hear the subjective adulations from reading listeners, the test of significantly making a difference comes from objective data. Reading Mastery Fast Cycle III's three levels of classroom testing provided objective data for effective teaching decisions. Precision Teaching's Standard Daily Behavior and Learning Charts showed daily practices and provided pupils with daily progress, weekly learning, and current incentive information. The pupils' daily practice Charts also showed the Camelot reading team learning pictures from which to make effective instructional and practice decisions.

Administrative periodic evaluations came from the circa 60-day progress checks charted on Precision Teaching's Standard Monthly Summary Behavior and Learning Charts.
Charting longer range performance outcomes on the Standard Monthly Summary Chart is outcome based measurement, but with proportional, multiply-divide Charts to better show performance, learning, and comparative data. Charts 1, 2, and 3, are examples of charted pupil test data on the Monthly Summary Chart.

Results

Charts 1 and 2 are Tatyana's Monthly Summary Chart showing seven tests with six progress checks across the ten academic months of 1992-1993. The correct and error learning lines drawn through the six checks of each test, when viewed together, are a learning picture pair (Lindsley, 1990), and each picture type can be counted. The Handbook of the Standard Behavior Chart (Pennypacker, Lindsley, and Koenig, 1972) describes the split-middle, quarter-intersect method for drawing these learning lines.

Two Charts recorded the year's seven, one-minute test performances and resulting learning pictures for each pupil, as shown, by Tatyana's two Charts.

Analyses. Pupils to supervisors compare Learning Charts by holding the translucent charts up to ceiling, window, overhead projector, or tracing board light. They learn to "eyeball" significance of differences because the Chart distances are always the same, and the distributions are always symmetrical and proportional.

Neely charted the frequency and celeration distributions to facilitate median tests for significance of differences using both Fisher exact and chi-square calculated probabilities. The actual pupil September and June frequencies, instead of the ends of the learning lines, provided the data to determine those probabilities.

Neely bundled five of the seven tests together in order to summarize each pupil's overall reading progress. The five, one-minute tests bundled together as one five-minute observation were say letter sounds, say words from the three wordlists, and say words from the story. This bundling excluded two tests, see-to-say letter names and see-to-say readiness sentences. There were three reasons to not include the see-to-say letter-names test. First, there was no instructional difference for teaching letter naming across the three years. Reading Mastery FC III ignores the letter-names until the year is nearly over. Second, there were no pupil see-to-say letter-name fluency building projects during any one of the three years. Finally, there were no significant differences in letter naming performances or learning rates among the three years. The reason to not include the see-to-say readiness-sentences data with the bundled-tests data was that this test did not exist until the second year. The two tests' data were viewed separately.

Chart 3 shows bundled learning picture pairs for five pupils.

Pupils' Correct Responses. Chart 4 shows a collection of the five bundled tests' correct (fluency) learning lines for the first-grade pupils for the three school years, '90-91, '91-92, and '92-93. Tracing paper placed over each pupil's learning line and tracing the line within its frequency and calendar points formed the learning line collections. A number 2 pencil made each line with the same pressure. The darker and/or wider lines noticed on each collection represent the paths of more learners. The three collection pictures look as though three winds blew sticks in respective directions, with errant puffs misdirecting some.

By further visual analysis (using a transparent straight edge helps), one can see that most of the '92-93 Reading Mastery Fast Cycle III pupils' fluency learning lines began lower than the learning lines of the '90-91 and '91-92 World of Reading years. Most of the '92-93 Reading Mastery Fast Cycle III pupils' fluency learning lines are steeper, showing faster fluency learning rates. Most of the '92-93 Reading Mastery Fast Cycle III pupils' fluency learning lines end in June as high as, or higher than, the upper halves of the two previous World of Reading years.

Chart 5 shows the fluency learning line distributions and the distributions' respective seven-line celeration profiles for the first-grade pupils for the three school years, '90-91, '91-92, and '92-
SUCCESSIVE CALENDAR MONTHS

Pupils Tellari Pardue-Wall SBG

- Say Sound/Word

SUPERVISOR

MANAGER

Camelot Elem. Volunteers Neely

GRD 1 Plus

0.001 0.005 0.01 0.05 0.1 1

COUNT PER MINUTE (Daily Averages)

0 100 500 1000

CHART 3

PROGRESS CHECKS (5, 1st bundled tests)

letters sounds, 3 word lists, level 5 story

R-LEVEL 5 WORLD OF READING

SBG

SUCCESSIVE CALENDAR MONTHS

SUPERVISOR

ADVISE!

MANAGER

Camelot Elem.

DEPOSITOR

AGENCY

Volunteers

Volunteers

Pupils

Neely

Neely

GRD 1

Plus

PT

To lower Q
FLUENCY CELEBRATION DISTRIBUTIONS AND SEVEN-LINE PROFILES (LEARNING)

- Precision Teaching with Lower Q
- Reading Mastery FC I/II plus Precision Teaching

PROGRESS CHECKS (51 bundles tests)
- letter sounds, 3 word lists, level 5 story
- R-Level 5

WORLD OF READING SBG

SUCCESSIVE CALENDAR MONTHS

CALENDAR YEARS

BOX 3351
KANSAS CITY KANS 68111

CURRICULUM and INSTRUCTION

DEPOSITOR AGENCY TIMER CONVLR CARTER

SUPERVISOR ADVISER MANAGER
Tellari Pardue/Wall
Camelot Elem.

say Sound/Word

PUPILS
DeHaven Neely
GRD 1

Say Sound/Word

SUCCESSIVE CALENDAR MONTHS

DEPOSITOR AGENCY TIMER CONVLR CARTER

SUPERVISOR ADVISER MANAGER
Tellari Pardue/Wall
Camelot Elem.
Neely charted the pupils' half-year learning rate-distributions for each academic year. Simple counting produced the seven celeration points on the distributions. The seven points provided information for drawing the seven-line celeration profiles.

Learning lines radiate from one central point to better show their relative rates of growth. The longer middle line represents the middle pupil fluency learning rate for each respective academic year. The learning lines above and below represent the pupil quarter rates, the next ten percent learning rates above and below, and finally, the fastest and the slowest pupil fluency learning rates.

The seven-line fluency learning line profiles simplify the picture collections for clearer analysis. Like the fluency learning line collections in Chart 4, Chart 5 shows the steeper (faster) fluency learning rates of the '92-93 Reading Mastery FC I/II Direct Instruction and Precision Teaching supplemental program compared with the previous two World of Reading, only, years.

The middle x7.3 per minute per half-year learning rate for '92-93 was nearly two times faster than the respective x4.0 (p = .0000001) and x3.6 (p = .000000034) previous years. Analyses of the other respective fluency learning lines show the same times two, half-year multiplier favoring the Reading Mastery Fast Cycle I/II, Precision Teaching practicing, and pupil Chart monitoring year.

Chart 6 shows seven-point fluency performance rate (frequency per minute) profiles from September to end-of-May or early-June for the five bundled tests for the three school years, '90-91, '91-92, and '92-93.

Neely charted each year's pupil performance distributions as just shown by the learning celeration distributions on Chart 5. Chart 6 does not show the charted pupil performance distributions. Simple counting produced seven performance points on the distributions. The seven points provided information for drawing the seven-point performance profiles onto Chart 6. The black circle represents the middle pupil fluency performance for each progress check during the academic year. Small lines above and below the middle represent quarter fluency performances. Small dots to either side of the vertical line represent the ten percent points above and below. Finally, ends of the vertical line represent the fastest and the slowest pupil fluency performance rates.

Again, one sees on Chart 6, as well as on Chart 4, significantly lower '92 September reading readiness starting points. The median test applied to the September middle scores finds lower '92 September differences significant to p = .000027 and p = .019, respectively. Chart 6 also shows slightly higher or higher '93 June reading fluency ending points. Applying the median test to end-of-May or early-June middle scores reveals higher '93 June differences significant to p = .136 and p = .014, respectively.

Individual learning pictures and Chart 6 show that six pupils were still at acquisition, below 20 correct responses per minute in June. They should have begun the Reading Mastery I sequence in September instead of Reading Mastery, Fast Cycle III. Reading Mastery I followed by Reading Mastery 2 doubles instruction, practice, and time; our six pupils would have profited more.

To see the performance progress of each class, for each academic year, follow the middle dots, or any other point, across and up the Chart. A transparent straight edge may help to view this progress, too. Chart 7 shows these drawn lines.

Chart 7 shows five-line learning profiles for the middle, quarter, and ten-percent points shown in Chart 6. The procedure for drawing the five best-fit learning lines through their respective quantile points is the same as for drawing Tatyana's learning lines in Charts 1 and 2.

Chart 7's learning lines do not show any specific pupil's growth, but rather specific point growth of each class. The middle learning line represents middle-point growth for each group. The lines directly above and below represent quarter-point growth. The highest and lowest lines represent ten-percent-point growth. One can read the respective learning rates (i.e., response change per minute, per month, per half-year, for each year in the lower half of the Chart.)
Fluency Performance Profiles

Progress Checks (5, 1' bundled tests)
- Letter sounds
- 3 word lists
- Level 5 story
- R- Level 5

World of Reading
SBG

SUCCESSIVE CALENDAR MONTHS

JMMJSMN JMMJSMN JMMJSMN JMMJSMN JMMJSMN
FAJAODFAJAODFAJAODFAJAODFAJAODFAJAODFAJAOD

COUNT PER MINUTE
(Daily Average)

0.05

0.01

0.005

0.001

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

Say Sound/Word

Supervisor: Tellari
Advisor: Pardue/Wall
Manager: Camelot Elem.
Depositor: Agency
Volunteers: Timer
Volunteers: Counter
Pupils: Behavior Neely
Age: GRD 1
Label: COUNTER
COUNTED
### FLUENCY PERFORMANCE PROFILES

**MIDDLE, QUARTER & TEN PERCENT-POINTS CELEBRATIONS**

<table>
<thead>
<tr>
<th>Filter</th>
<th>SBG</th>
<th>Precision Teaching plus</th>
<th>Reading Mastery FC II</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lower Q</td>
<td>3.8</td>
<td>x 3.3</td>
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### SUCCESSIVE CALENDAR MONTHS

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For example, the line representing the change rate (learning rate) of the ’92-93 group’s middle scores is x6.0 per half-year, while the quarter lines are both x6.5 per half-year. The upper and lower ten-percent-points improved similarly with learning lines at x6.5 and x6.0, respectively.

Charts 4, 5, and 7 all show the steeper learning lines of the exemplary ’92-93 Reading Mastery and Precision Teaching year.

Another steep line needs to be examined, as well. Notice the x5.0 bottom ten-percent learning line of ’91-92. It represents the faster learning rates of the least prepared September ’91 pupils. It shows a catch-up rate, that if sustained, would propel these learners beyond their neighboring peers. These were the pupils who received a full year’s focus of Precision Teaching rapid practicing and pupil Chart monitoring as supplemental to SBG. The other ’91-92 SBG pupils received less or no Precision Teaching practice, and their slower learning lines reflect the omission.

Pupils’ Learning Opportunities (incorrect/error responses). Chart 8 shows a collection of the five bundled tests’ error learning lines for the first-grade pupils for the three school years. As it was with Chart 4, tracing each pupil’s learning line formed these error learning line collections. These error learning line collection pictures look as though three different types of winds controlled the lay of the sticks. The ’92-93 force converged from the top, toppling the higher over the lower, and fanned them downward, so as to appear riveted together near the beginning. This error learning picture collection began as a x10 spread, converged to a x3, and spread to a x20.

The ’91-92 force confronted the sticks at once, but with accompanying winds. The major force pushed with less directional change. The two other forces blew one set steeper and another set counter to the major force. This error learning picture collection began as a x100 spread, converged to a x40, and spread to a x90.

The ’90-91 forces appeared even more diverse. The sticks appear as though a dust-devil blew through the center causing disarray. This error learning picture collection began as a x100 spread, converged to a x20, and spread to a x90.

Again, by visual analysis, one can see that the ’92-93 Reading Mastery Fast Cycle IIII pupils’ error learning lines began higher than most of the previous two World of Reading years. More of the ’92-93 Reading Mastery Fast Cycle IIII pupils’ error learning lines are steeper, showing faster accuracy learning. The pupil error learning lines end in June with the same error spread for all three years.

Chart 9 shows error learning line distributions and the distributions’ respective seven-line error learning line profiles for the first-grade pupils for the three school years. As for Chart 5, above, Neely charted the pupils’ half-year learning rate distributions for each academic year. Simple counting determined the seven error-celeration points on the distributions. The seven points provided the information for drawing these seven-line error-celeration profiles.

The longer middle line represents the middle-pupil error learning rate for each respective academic year. The learning lines above and below represent the quarter rates, the next ten percent learning rates above and below, and finally, the slowest and the fastest error, or accuracy, learning rates. The middle +3.3 per minute per half-year accuracy learning rate for ’92-93 was 1.8 times faster than the two +1.8 previous years (p = .01 and p = .000009, respectively).

As the fluency learning line collections in Chart 5 show, Chart 9 indicates the steeper (nearly two times faster) error learning rates of the ’92-93 Reading Mastery Fast Cycle IIII Direct Instruction and Precision Teaching supplemental program.

Chart 10 shows seven-point error performance rate (frequency per minute) profiles from September to end-of-May or early-June for the five bundled tests for three school years. Neely charted each year’s pupil error-performance distributions to determine the seven distribution performance-points, as he did for Charts 5, 6, and 9. The X represents the middle pupil error-performance for each progress check during the academic year. Small lines above and below the middle represent quarter error performances.
ERROR LEARNING COLLECTIONS

SUCCESSIVE CALENDAR MONTHS

Tellari Pardue/Wall
Camelot Elem.

Volunteers
Volunteers

Pupils

AGE

Say Sound/Word

\text{CURRICULUM AND INSTRUCTION}

\text{PRECISION TEACHING WITH LOWER Q}

\text{READING MASTERY FC I/II}

\text{PROGRESS CHECKS (5,1 'bundled tests) letter sounds, 3 word lists, level 5 mastery R-Level5}

\text{WORLD OF READING}

\text{SGB}
ERROR CELEBRATION DISTRIBUTIONS AND SEVEN-LINE PROFILES
(LEARNING)

PROGRESS CHECKS (5, 1" bundled tests)
letter sounds, 3 word lists, level 5 story
R - Level 5

WORLD OF READING
SBG

SUCCESSIVE CALENDAR MONTHS

SUPervisor
Tellari
Purdue/Wall
Volunteers
Pupils
AGE
Say Sound/Word

DEPOSITOR
Camelot Elem.
ADVISER
ManAGER
VOLUNTEERS
DEBEYER
LABEL
COUNted

0 10 20 30 40 50 60 70 80 90 100 110 120
Small dots to either side of the vertical line represent ten-percent points above and below. Finally, ends of the vertical line represent the highest and the lowest pupil error rates.

Chart 11 shows five-line learning profiles for the middle, quarter, and ten-percent points shown in Chart 10. The procedure for drawing the five best-fit learning lines through their respective quantile points is the same as for drawing Tatyana's learning lines in Charts 1, 2, and 7. Chart 11's error learning lines do not show any specific pupil's learning rate, but rather the specific point rate-of-change for each class.

The middle error learning line represents middle-point growth for each group. The lines directly above and below represent quarter-point growth. Highest and lowest lines represent ten-percent-point growth. One can read the respective error learning rates, (i.e., error-response change per minute, per month, per half-year) for each year in the lower half of the Chart.

Learning Pictures. Charts 1 and 2 show Tatyana's seven learning picture pairs. All (1977) and Sokolove's (1977-1978) pupils descriptively named the first three Chart 1 pictures and the first two Chart 2 pictures, Cross-over Jaws. They named the last Chart 1 picture, Climb, because fluency is climbing away from the maintaining low-frequency errors. They named the last Chart 2 picture, Take-off, because the fluency line is taking off away from the maintaining, mid-level errors.\(^1\) With instruction and more practice, Tatyana could turn her Take-off into Cross-over Jaws.

Chart 3 shows five learning picture pairs for five, one-minute bundled tests from the '91-92 first-grade class. Seira's picture is Jaws with a wide hinge. Monica's picture is Cross-over Jaws. Jessie's picture is Take-off. Sabrina's picture is Mid-level. Stacie's picture is Up-hill. The first two pictures show reading skill attainment. The last three pictures, Jessie's, Sabrina's, and Stacie's, indicate skill difficulty for decoding unknown words, and with no projection for improvement.

After counting the three years' learning pictures, we see the years '90-91 and '91-92 have 28% and 33% of their learning pictures, respectively, showing maintaining or increasing errors. These pictures look like Jessie's Take-off, Sabrina's Mid-level, and Stacie's Up-hill. The Reading Mastery-Precision Teaching '92-93 class had 100% Cross-over Jaws showing all pupils with improving accuracy. All '92-93 pupils' decoding skills were improving with effective instruction, practice, and informed progress.

Discussion

Review of past literature showed no functional difference among traditional reading basals. Chall (1967, 1977) cited that teachers perceive missing components in whatever program they use and insert that missing instruction and practice. Such additions resulted in nearly the same programs. Moreover, most publishers loosely design their series' curriculum and instruction, and teachers ambiguously interpret the loose design.

Neely and Lindsley (1978), while measuring three years of pupil performances and learnings with 17 different reading curricular materials, noted that traditional basals showed the same learning results with special education pupils. Project Follow Through assessment showed that programs presenting highly structured instruction that had a tight teacher-performance requirement with practices that are "behavioral" produced the best readers. Adams (1990), building on Chall's work, lists effective reading development traits for which basals should aspire.

This research lead Camelot's Chapter 1 Steering Committee to select SRA's Direct Instruction Reading Mastery Fast Cycle III Series. The members counted on the curricular and instructional design to make a difference.

\(^1\) The errors, or learning opportunities, of Tatyana's Climb and Take-off pictures do show decelerating and accelerating lines, but they change so slightly across the months that they were considered, here, as maintaining x1.0.
Researchers also find letter naming fluency to predict reading development success. Adams (1990) summarizing Chall's research, the USOE First-Grade Studies, and others, cites, "...the speed with which [pupils] can name individual letters both strongly predicts success for prereaders and is strongly related to reading achievement among beginning readers." She cautions that skill in naming letters is not causal to reading success, but predictive to reading success.

The three classes came from the same neighborhood population, though the third year had an increased ESL influence. The three first-grade classes' letter naming was similar in September and remained similar in June. It is reasonable, then, to assume that all three first-grade classes should progress, similarly in reading skill development. With all curriculum, instruction, and practice being the same, the learning pictures for these similarly endowed pupils should be statistically the same from year to year.

However, after a year's kindergarten SBG World of Reading readiness instruction, the '92-93 class was well behind the '91-92 class, and even further behind the '90-91 class in reading readiness skill fluency and accuracy. Add-on events in first grade intervened to alter the learning trends. An add-on event of Precision Teaching's daily practicing by, and reporting to, the most-at-risk pupils of the '91-92 class promoted catch-up learning rates.

Add-on events of Reading Mastery, Fast Cycle III and Precision Teaching's daily practicing by, and reporting to 44 most-at-risk pupils promoted catch-up learning rates that propelled the group from significantly behind to significantly beyond the '91-92 class, and just beyond the '90-91 class.

The May first-grade scores of the Iowa Test of Basic Skills (ITBS) also show the above class end-of-year achievement relationships. The ITBS has no provision to show lower September readiness skills, nor the pupils' progress speeds (learning rates) to catch up. Precision Teaching's measurement and Charts do show the pupils' beginning reading readiness skills. The Charts show the pupil's learning rates (the slope of the learning lines). The Charts also show the pupils' June reading skills.

The '91-92 most-at-risk pupils' steeper learning rates show what educationally effective practice design can do. The progress of the 92-93 class, starting lower, but exceeding or equaling the other classes' reading skills, shows what educationally effective curriculum, instruction, and practice design can do.

The daily measurement of 92-93 pupils' reading Reading Mastery's story-of-the-day showed the January entry reading around 25 correct words-per-minute in June. Four read their story-of-the-day in June, around 50 correct words-per-minute. The remaining 39 pupils met or beat our 70 to 90 words-per-minute aim range by reading in June between 70 to 180 correct words-per-minute. Accuracy for all was near perfect to perfect.

Objective measurement confirms the subjective observations of the higher grade teachers, noting the more accomplished '92-93 first graders' reading skill attainments. Objective measurement confirms the classroom visitors' inability to discern the '92-93 ESL pupils from the other pupils in June.

The downward trend in starting lower after kindergarten and entering first grade is correctable by instigating Reading Mastery Direct-Instruction and Precision Teaching practice and measurement earlier--as in Kindergarten and Head Start.

Charts 3 and 6, document Camelot's decreasing September reading readiness skills. Camelot's increased ESL population adds to the school's language development needs. Mathematics skill building always needs fortification.

Schools that start Direct Instruction programs in preschool and kindergarten, and continue with these programs, show highly skilled pupils, afterwards. Some time ago, the Seattle School District evaluation department discovered that a disproportionately high percentage of black kids in the district's gifted program had attended the
District's CAMP1 program. The CAMP1 schools are a totally Direct Instruction preschool-kindergarten program (Engelmann, 1992).

Wesley Elementary is another total Direct Instruction school (SRA, 1991). Wesley is in the center of one of Houston's poorest neighborhoods. Virtually all of its pupils come from low income backgrounds; the majority receive free lunch. The number of free lunches determines eligibility for Chapter 1 monies because lack of income correlates highly with the educationally impoverished. Because of Wesley Elementary's achievements, the school was rendered ineligible for Title 1, now Chapter 1, services in spite of their free lunch count.

Parents throughout North America are teaching their bright three-and-a-half year olds, and average or better four year olds, to read in 100 easy lessons. The parents are using a book entitled *Teach Your Child to Read in 100 Easy Lessons* patterned after the *Reading Mastery I* program (Engelmann, Haddox, & Bruner, 1983).

The reports for...100 Easy Lessons are exciting. One such experience with...100 Easy Lessons is right here in Federal Way. The youngster, in kindergarten, finished the program by his sixth birthday in late October. The youngster's dad, also his teacher, shares his son's Precision Teaching practice results showing extraordinary learning. Dad and son share and celebrate their accomplishments together—and they will, forever.

Pupils find motivation by their progress shown on their own Charts. Stronger dedication to practice tasks comes from pupils' charting their own performances. Stronger ownership of practice tasks comes from pupils' viewing and discussing ways for improving. Lindsley reports, "Many teachers have found that behavior changes are much greater when students take such an active role" (1990).

In the classroom daily skill-practice measurement shows the teacher a pupil's current performance, learning rate, and aim. The Standard Learning Chart projects future performance. A decision to continue or change tactics to meet or beat an aim is possible at the moment of projection, rather than after a unit is over. Pupils' self-charting daily and teachers' viewing at least weekly have a decided learning improvement advantage over classrooms and programs that do not.

Periodic evaluations of groups provide for more current administrative decisions, as well. Pupils' weekly learning line collections traced from their Daily Standard Learning Charts show periodic evaluations. Monthly Standard Learning Charts as shown in this report, and Weekly Standard Learning Charts show periodic evaluations.

Standard Chart recording also serves as memory of what works and what does not work. Both tenured and new decision makers can tell what programs to keep and what to throw away.2

The Federal Way School District should demand proven educationally effective curriculum, instruction, practice, and measurement programs that will ensure all its pupils and parents with accomplishments and celebrations. This Camelot experience pilots the way.3

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2 So long as school districts are permitted to construct obstacles through their guidelines and their mandated practices, there will be no excellence in education. An occasional exemplary program will spring up, but it will die, and the administration will later have no memory of its life or its death, because the people who compose this administration will be new people with new and rich ideas, based on the latest opinions about how kids learn. (Engelmann, 1992).

3 The Camelot pilot is dead, however. A queen and prince of Whole Language captured and rule the kingdom. All the Lords and Ladies are bent to their will, but continue to receive their customary rations. Only the children surrounded by glitter and fanfare receive less fare, and suffer. Unfortunately, there are no plans to continue enhancing the Camelot SBG, Whole Language driven and sight based *World of Reading* with Direct Instruction's *Reading Mastery* or with Precision Teaching's practice and measurement techniques. The pilot is dead.
Conclusions

1. The SBG World of Reading level 1-3 and the Reading Mastery I are not appropriate for September first-graders who already read fluently. Fluent and accurate pupils can profit from more challenging levels.

2. Reading Mastery I followed by Reading Mastery II is more appropriate than Reading Mastery, Fast Cycle III for the more at-risk pupils.

3. Precision Teaching assisted in faster '91-92 at-risk pupils' fluency development (x1.4 faster than the class' average learning).

4. Reading Mastery and Precision Teaching combined to produce faster '92-93 fluency development (x1.8 and x2.0 faster than the previous classes' learnings, respectively).

5. Reading Mastery and Precision Teaching combined to produce faster '92-93 accuracy development (x1.8 faster than the previous classes' learnings).

6. Teachers are not the cause of faulty reading development. The same teachers taught all three years.

7. Labeled pupils (e.g., special education, ESL, Chapter 1) learn to read effectively with effective curriculum, instruction, practice, and measurement. The two '92-93 class special education pupils read with the top third of the class. All 13 ESL pupils were June readers, including the January non-reading entry.

Recommendations

1. Continue the first-grade pilot Reading Mastery, Fast Cycle III Direct Instruction program plus Precision Teaching's pupil practice, pupil response, and pupil learning measurement to enhance Camelot's daily Whole Language training for the '93-94 school year. The materials are all in place, but currently stored.

2. Identify the most at-risk Camelot first-graders and place them in the Reading Mastery I sequence as September or October data indicate.

Reading Mastery I program is now available to Camelot through a Chapter 1 summer purchase.

3. Identify the most at-risk Camelot first-grade ESL pupils and place them in the appropriate Direct-Instruction Language program. DISTAR Language I is now available to Camelot through a Spring, '93 gift from Camelot's PTA, but is also in storage.

4. Beginning in September or October, use the Direct Instruction DISTAR Language I program with identified Camelot Kindergarten ESL youngsters.

5. By just before winter break, begin Reading Mastery I in Camelot's Kindergarten to all pupils to better prepare them for first grade in '94-95.

6. Continue Direct Instruction Reading Mastery instruction with identified Camelot second graders.

7. Use currently trained Reading Mastery staff at Camelot to train the Kindergarten and new Basic Skills teacher(s). Training tapes are available at Camelot, and contact with SRA might well provide Direct Instruction trainers, again.

8. Extend the Camelot pilot Direct Instruction and Precision Teaching programs plus above recommendations to FWSD's other elementary schools, especially those with high numbers of at-risk pupils (for whatever reason), but not exclusively. All non-readers will learn through Direct Instruction Reading Mastery series. All learners will increase their performances and learning rates with Precision Teaching's daily practices and Chart interaction. Chart viewing will provide teachers, administrators, and school board members a recorded memory for educationally sound decision making.

9. Raise district expectations by setting the goal that all pupils will learn to read by the end of first grade.
References


Behavior Research Company. (no date). Learning (celeration) charts, rate finders, and related materials available from Behavior Research Company, Box 3351; Kansas City, KS 66103


J/P Associates, Inc. (no date). 8719 Radburn Dr.; Baldwinsville, NY 13027.


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Standard Glossary and Charting Conventions*

**Acceleration Target** - a movement the behaver, 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; celeration correct/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.

**Aim** - an ending goal set for an individual; usually expressed as a specific frequency; symbolized by drawing an "A" at the expected frequency.

**Aim Star** - an ending goal indicating an aim date as well as an aim rate or frequency; symbolized by drawing an "A" at the expected frequency on the aim date.

**Behaver** - person whose behavior is displayed on the Chart.

**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 frequencies of a given movement on the Standard Celeration 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.

**Counted** - the behavior being measured.

**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.


Deceleration Target - - a movement the behaver, manager, advisor, or supervisor expects to decelerate; the frequency is symbolized by placing an “x” on the Chart.

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

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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 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.

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

Manager - - person who works with the behaver 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 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 used for difficult visual identification of celeration. Draw a vertical line halfway between the time period covered by the data (include ignored and no chance days), divide it into two equal parts and then divide the equal parts into halves. Locate the median frequency for each half and put a dash where the median frequency value and the quarter line intersect for each half period; then draw a line connecting the dashes. This is the celeration line for measuring trend and direction of the frequency dots.

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

SAF MEDS - a card deck with questions on one side and answers on the other. The mnemonic is - Say All, Fast, a Minute, Every Day, Shuffle.

Single Improvement Learning Picture - one movement of an accuracy pair with a celeration in the expected direction; for example,

```
  x x  x x
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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 Celeration 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 Behavior Chart.

Supervisor - a person who views the Charts on a frequent 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.


** Additions to the Third Revision
The multidisciplinary journal of standard behavior measurement published by the Standard Celeration Society.  

**Volumes I and II** (April, 1980--January, 1982)  
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