The *Journal of Precision Teaching* is dedicated to the direct and continuous measurement of behavior, the recording of frequency and the representation of celeration on the Standard Behavior Chart and Chart-based decision-making. 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 data-sharing are encouraged.

Material submitted for publication should meet the following criteria: (1) be written in plain English, (2) be limited to 8 typed, double-spaced pages of narrative, (3) use the *Journal of Precision Teaching* Standard Glossary and Charting Conventions, (4) contain data displayed on the Standard Behavior Chart and (5) be submitted in triplicate to the editor. Each manuscript will be reviewed by the editor and one consulting editor, both of whom must approve it prior to publication.

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Second-class postage pending at Kansas City, Missouri.

As part of its goal to disseminate research, the University Affiliated Facility for Developmental Disabilities (UAF) at the University of Missouri in Kansas City, under the direction of Carl Calkins, assisted with the production of this Journal.
Journal of Precision Teaching

Volume I  April, 1980  Number 1

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(a child yet to be named)
Abstract: Learning Pictures and Learning Picture Reports provide a new approach to program evaluation. The implementation of this approach at Shemood Center for autistic children in Kansas City, Missouri was described.

The process of precise program evaluation was conducted in two steps. First, learning pictures formed by the most recent celebrations of each child's charted academic assessments were recorded and categorized as GROWTH, MAINTENANCE or REGRESSION on a Learning Picture Report form. Each teacher also recorded revisions she chose to make in instructional programs as well as criterions reached by the children. Second, the Program Director summarized these Learning Picture Reports, charting the frequency of GROWTH, MAINTENANCE and REGRESSION pictures, as well as program revisions and criterions reached.

Periodic celebrations of the summarized data measured the overall effectiveness of the academic program for each term of the 1978-79 school year. These celebrations indicated that the instructional program was more effective during the second term with respect to both Learning Pictures and criterions reached. The authors suggest that this approach provides sensitivity to changes in overall instructional effectiveness and a precise program evaluation. They further suggest that Learning Picture Report data have the potential to answer detailed questions regarding instructional effectiveness.

Checklists, peer panels, controlled comparisons and standardized tests all have been used to measure the effectiveness of instructional programs (Stake, 1972). Dissatisfaction with these methods has led school administrators to seek new alternatives.

Sherwood Center, Inc. is a private, not-for-profit school for autistic children located in Kansas City, Missouri. Program evaluation is conducted using the Standard Behavior Chart, Learning Pictures and Learning Picture Reports. A description of this new approach and the results of the first year of implementation are reported.

METHOD

Subjects. Eight (8) female teachers and 36 autistic children participated in the study. The children included 9 girls and 27 boys ranging in age from 2-15. Each child had been diagnosed as autistic/developmentally
disabled. The children had been placed at Sherwood Center for speech, language, social and academic training. They were grouped into 8 classrooms according to language and social skills.

Procedure. Prior to the start of school, a Sherwood Center staff development workshop was conducted in which data collection and reporting procedures were taught. The staff learned how to pinpoint behaviors and chart data on the Standard Behavior Chart. Throughout the school year, these procedures were used to conduct weekly assessments of each child's performance on his/her academic curriculum tasks. The teachers learned to summarize these assessments by drawing acceleration lines through charted frequencies correct and incorrect, forming two-line learning pictures.

Each child's learning pictures were described and categorized in a Learning Picture Report form (Wood, 1978) which was designed specifically for Sherwood Center after a similar model developed by Sokolove (1978). As recommended by Sokolove (1978), the Learning Picture Report form was developed inductively, that is, from learning pictures exhibited by the children. Model pictures were chosen to represent 50 distinct learning pictures exhibited by the children at Sherwood Center.

As shown in Figure 1, the Sherwood Learning Picture Report (Wood, 1978) categorized learning pictures as GROWTH (OK), MAINTENANCE (WATCH) or REGRESSION (CHANGE). GROWTH pictures are those that show frequencies correct and/or frequencies incorrect changing in the desired directions, that is, frequencies correct accelerating and/or frequencies incorrect decelerating. MAINTENANCE pictures are generally those in which frequencies correct and incorrect parallel one another. Frequencies correct and incorrect may be changing, but they are changing in the same direction at the same rate. REGRESSION pictures are those in which frequencies correct are decelerating and/or frequencies incorrect accelerating.

Every week teachers completed a Learning Picture Report on each child. As shown in Figure 1, teachers recorded the specific curriculum tasks and their learning channel teaching procedures. For each procedure, the learning picture formed by the most recent accelerations was recorded in the appropriate column. The number of weeks the child had spent on the curriculum/procedure and the number of weeks since the last program revision were also recorded. If a child reached criterion on a curriculum/procedure, the teacher recorded this, as well as the task the child was to perform next. Finally, the teacher indicated what program revisions, if any, she intended to make to transform MAINTENANCE and REGRESSION pictures into GROWTH pictures. One copy of this report was submitted to the Program Director and another sent home to the parents.

In order to measure the overall effectiveness of the academic program at Sherwood Center, the Program Director summarized the weekly Learning Picture Reports for all children. She recorded and charted the frequency of GROWTH, MAINTENANCE and REGRESSION learning pictures, criterions reached and program revisions on the Weekly Standard Behavior Chart.
## SHERWOOD LEARNING PICTURE REPORT

**Figure 1**

<table>
<thead>
<tr>
<th>CURRICULUM</th>
<th>PROCEDURE</th>
<th>OK</th>
<th>WATCH</th>
<th>CHANGE</th>
<th>WEEKS ON</th>
<th>PROGRAM REVIEW/REVISION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cutting F (circle)</td>
<td>...do</td>
<td>¥</td>
<td>¥</td>
<td>¥</td>
<td>3 3</td>
<td>No Change</td>
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<tr>
<td>Writing Shapes</td>
<td>look-wri</td>
<td>¥</td>
<td>¥</td>
<td>-</td>
<td>3 3</td>
<td>Step back to <code>lines</code></td>
</tr>
<tr>
<td>Writing Numerals 0-10</td>
<td>...trace</td>
<td>¥</td>
<td>¥</td>
<td>-</td>
<td>3 1</td>
<td>No change yet</td>
</tr>
<tr>
<td>General Information II</td>
<td>listen-say</td>
<td>¥</td>
<td>¥</td>
<td>-</td>
<td>3 3</td>
<td>Increase # of teaching sessions</td>
</tr>
<tr>
<td>Numeral ID: 11-26</td>
<td>look-say</td>
<td>¥</td>
<td>¥</td>
<td>-</td>
<td>2 2</td>
<td>No change</td>
</tr>
<tr>
<td></td>
<td>listen-find</td>
<td>¥</td>
<td>¥</td>
<td>-</td>
<td>2 2</td>
<td>Criterion met</td>
</tr>
<tr>
<td></td>
<td>look-find</td>
<td>¥</td>
<td>¥</td>
<td>-</td>
<td>2 2</td>
<td>No change</td>
</tr>
<tr>
<td>Picture ID:</td>
<td>listen-say</td>
<td>¥</td>
<td>¥</td>
<td>-</td>
<td>2 2</td>
<td>No change</td>
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<tr>
<td>Animals D</td>
<td>look-say</td>
<td>¥</td>
<td>¥</td>
<td>-</td>
<td>1 1</td>
<td>No change</td>
</tr>
<tr>
<td></td>
<td>listen-find</td>
<td>¥</td>
<td>¥</td>
<td>-</td>
<td>1 1</td>
<td>No change , Move up to set III, retain missed items</td>
</tr>
<tr>
<td>Articulation 2-syl. C</td>
<td>look-say</td>
<td>¥</td>
<td>¥</td>
<td>-</td>
<td>2 2</td>
<td>No change</td>
</tr>
<tr>
<td>Toys &amp; R. A</td>
<td>look-say</td>
<td>¥</td>
<td>¥</td>
<td>-</td>
<td>2 2</td>
<td>No change</td>
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<tr>
<td></td>
<td>listen-find</td>
<td>¥</td>
<td>¥</td>
<td>-</td>
<td>2 2</td>
<td>No change</td>
</tr>
<tr>
<td>Playskill-18 pc. puzzle</td>
<td>...do</td>
<td>¥</td>
<td>¥</td>
<td>-</td>
<td>3 3</td>
<td>Criterion met/Next?</td>
</tr>
</tbody>
</table>

9 Curricula 11 Growth 2 Maintenance 2 Regression

STUDENT MCHL MANAGER DATE 1-30-79

**Figure 1. Sherwood Learning Picture Report**
RESULTS

Chart 1 illustrates periodic celerations by term of the total number of learning pictures, as well as GROWTH, MAINTENANCE and REGRESSION pictures for all children at Sherwood Center. During the first term, MAINTENANCE pictures accelerated faster than all other pictures. During the second term, GROWTH pictures accelerated, while MAINTENANCE and REGRESSION pictures decelerated. These celerations indicate that instruction was more effective during the second term.

Chart 2 combines MAINTENANCE and REGRESSION pictures and even more clearly illustrates increased instructional effectiveness during the second term. Chart 2 also shows the celeration of program revisions and indicates that teachers made more revisions at the beginning than at the end of each term.

Chart 3 illustrates the almost identical celerations of the total number of learning pictures and the total number of criterions reached during both terms. The ratio between total learning pictures and criterions reached was x5 during the first term and x4 during the second term. This indicates increased instructional effectiveness during the second term.

DISCUSSION

The overall effectiveness of the academic program at Sherwood Center increased from the first to the second term during the 1978-79 school year as demonstrated by charts of Learning Pictures and criterions reached. These charts enabled the Program Director to be sensitive to changes in instructional effectiveness, while providing a precise program evaluation.

Many questions were raised during the school year as a result of the Learning Picture Report data. How do curriculum tasks, learning channel teaching procedures, instructional programs and functioning level of the student affect learning pictures? How often do program revisions change MAINTENANCE or REGRESSION pictures into GROWTH pictures? What types of program revisions are most effective? Learning Picture Report data have the potential to effectively answer these questions.

REFERENCES


Deborah L. Wood, Program Director, and Dina Fisher, Executive Director, are co-founders of Sherwood Center for the Exceptional Child, Inc., 1617 West 45th Street, Kansas City, Missouri 64111.
Chart 1. Total, Growth, Maintenance and Regression Learning Pictures
Chart 2. Total, Growth, Maintenance and Regression
Learning Pictures and Program Revisions

Chart 3. Total Learning Pictures and Criteria Reached.
Abstract: The present study used the Standard Behavior Chart and its related research principles to compare learning at the inventory instructional level and three other widely spread performance levels. Two weeks of daily frequencies collected from the reading behaviors of 49 fifth graders provided celerations for the four performance levels tried minutes apart. The findings showed no significant differences in the distributions of celerations at the four performance levels. The authors challenged reading teaching practices that place a premium on high performance levels and called for careful evaluation of the Standard Behavior Chart as a research tool.

Many reading teachers place children in reading materials at the instructional level of an informal reading inventory believing that placing children at this performance level promotes highest learning. This study used the Standard Behavior Chart and its related research principles to validate a performance level for highest learning. The question was: Is the instructional level of the informal reading inventory or any of three other performance levels a level that promotes highest speed or accuracy learning.

BACKGROUND

The Standard Behavior Chart

Natural scientists and mathematicians have long recognized the advantages of the semilogarithmic chart for showing proportional and percentage relationships. Since Skinner's pioneering work in operant conditioning (1938), scientists have recognized the precision and universal applicability of frequency for measuring behavior. However, it was not until the middle 1960's that Lindsley (1971) combined the semilogarithmic chart with frequency to form a chart, now called the Standard Behavior Chart, that measured proportional changes in behavior.

Early users of this Chart noticed that behavior frequencies on the Chart often accelerated or decelerated as time passed. Also, these "CELERATIONS" were generally linear. If indeed, the changes in behavior frequencies were linear on a semilogarithmic scale, then behavior changes by a constant multiple rather than by a constant addend, or like the compounding interest of a savings account rather than like uniform deposits to a cash box.

In 1972, Koenig used over a thousand phases of behavior frequencies with over 10 percent change per week from research journals and the Behavior Bank (1971) to confirm that linear celerations on the Standard Behavior
Chart appropriately represented changes in behavior. The straight lines drawn through at least 10 frequencies bisected the frequencies and the variance on the Standard Behavior Chart. Since 1972, many research projects involving thousands of children have confirmed Koenig's findings and challenged traditional analysis of research data by add gains.

The Standard Behavior Chart is not new to the world of reading research. Of special significance to this study was Johnson's (1971) research that showed frequencies on the Standard Behavior Chart measured reading performance and learning in several curricula tried minutes apart. Another study (Stiles & Martin, 1973) showed reading frequencies and changes in reading frequencies were normally distributed on the semilogarithmic scale, that is, were spread across people by the same multiple up as down. Findings from both of these studies became part of the research design for the present study, which compared distributions of changes in frequencies from different grade levels of curricula tried only minutes apart.

The Informal Reading Inventory

The informal reading inventory (IRI) is a widely used technique for placing students in materials. The IRI uses a series of passages from materials representing different grade levels. The student reads the passages orally and answers comprehension questions while the teacher records incorrects. The teacher places the student for instruction in materials in which the student reads passages at some defined performance level.

Did highest learning data validate any of the currently used instructional performance levels of the IRI? Cooper (1952) tested 1000 elementary children and found that, as a group, children who made the fewest word recognition errors made the greatest grade equivalent score gains in reading achievement. Cooper concluded that instructional level criteria of the IRI should be 96-98 percent accuracy for word recognition and 60-70 percent accuracy for comprehension. No validation studies were found using a more immediate measure of highest learning, namely, the change in daily reading frequencies plotted on the Standard Behavior Chart.

METHOD

The present study included 49 fifth graders in a rural Kansas school district. Each child received an informal reading inventory using rate builders from Scientific Research Associates (SRA) reading laboratory IIb. Each child's instructional level was the highest grade level in which the child had at least 95-99 percent word recognition accuracy and 75-90 percent comprehension accuracy. Substitutions, mispronunciations, assisted words, punctuation skips, insertions, hesitations and omissions as defined by McCracken (1967) counted as incorrects. Of eleven authors reviewed by Powell (1971), these percentage levels and criteria for incorrects were recommended by more authors than any others.

For at least 10 school days the children read and charted their progress at four performance levels: their instructional level, one grade level below, and two and six grade levels above that instructional level. At least 10 days were required to measure learning at each level for each
child (Koenig, 1971). The steps between grade levels increased by
doubling (+1, +2, +4) and represented performance levels from nearly
perfect to high incorrect.

The daily procedure was as follows: (1) untimed silent reading of a
story from one of four randomly ordered SRA rate builders, with oppor-
tunity for help with new words or content; (2) one minute see-mark tim­
ing on SRA multiple choice comprehension questions; (3) checking of
comprehension answers; charting frequency correct and incorrect on the
Standard Behavior Chart; (4) one minute see-say word recognition timing;
(5) checking words read; charting frequency correct and incorrect on the
Chart; and (6) repeating steps 1-5 for the remaining three performance
levels.

RESULTS

The daily procedure generated at least 10 frequencies for each of the 16
reading behaviors—corrects and incorrects in both word recognition and
comprehension at each of the four placement levels—for each child.
Charts 1 and 2 show an example of one child's frequencies for word recog­
nition and comprehension recorded on Daily Standard Behavior Charts. Each
Chart contains the reading frequencies and celerations for 4 placement
levels.

For an index of speed learning, the study used freehand celeration lines
drawn through each set of at least 10 frequencies. The celeration was
measured with a celeration finder. The Pearson product-moment correla-
tion coefficient between the celeration of these lines and the celeration
of lines drawn by the linear regression formula was \( r = .88 \). This corre-
lation between freehand lines and formula-drawn lines from \( 2.0 \) to \( x2.0 \)
was comparable to the correlation of \( r = .99 \) shown by Hnetish (1977) for
celerations from \( x1.05 \) to \( x13.00 \).

For an index of accuracy learning, the study used the accuracy improve-
ment multiplier. The accuracy improvement multiplier tells how much the
accuracy multiplier multiplied or divided each week. The accuracy multipli-
ger is the number a median frequency incorrect is multiplied by to get
its related median frequency correct. It tells the number of correct
responses there were for each incorrect response. For example, a child
has an accuracy multiplier go from \( x2.0 \) to \( x3.0 \) in one week, yielding an
accuracy improvement multiplier of \( x1.5 \).

The speed and accuracy learning indices were analyzed in order to answer
the central research question of the study: was the instructional level
of the IRI or any of three other performance levels a level of highest
speed or accuracy learning?

Visual comparisons of distributions of celerations-corrects, celerations-
incorrects and accuracy improvement multipliers in word recognition and
comprehension at the four placement levels showed normally spread dis-
tributions, but no differences for any placement level (see Charts 3 and
4). Median test (Siegel, 1956) comparisons yielded no significant dif-
ferences at any placement level (\( p < .01 \)).
Chart 1. One Child's Frequencies and Celerations- Word Recognition
Chart 2. One Child's Frequencies and Celerations - Comprehension
Accuracy Improvement Multipliers

<table>
<thead>
<tr>
<th>PLACEMENT LEVELS</th>
</tr>
</thead>
<tbody>
<tr>
<td>IL+6L</td>
</tr>
<tr>
<td>IL+2GL</td>
</tr>
<tr>
<td>IL+GL</td>
</tr>
<tr>
<td>IL-GL</td>
</tr>
</tbody>
</table>

NEUFELD, Karen and LINDSLEY, Ogden. Charting to compare children’s learning at four different reading performance levels. *Journal of Precision Teaching*, Volume 1, Number 1, April 1980.
DISCUSSION

This study used the Standard Behavior Chart and its related research principles to examine the question: was the instructional level of the informal reading inventory or any of three other performance levels a level that promoted highest learning? Distributions of speed and accuracy celerations showed no significant differences in children's learning at any of the performance levels. Thus, neither the inventory instructional level nor any of the other performance levels promoted highest learning.

Implications for Educational Practice

The findings from this study challenge reading teaching practices that place a premium on high performance. One of these practices is to place children in reading materials at the instructional level of the informal reading inventory. If placement at this level does not promote highest learning, should teachers use the level at all? Further research is needed to test whether or not placement at the inventory instructional level achieves any other purpose.

Did this study eliminate the need for the informal reading inventory? Although the inventory does not select a performance level for highest learning, it may still be useful for assessing strengths and weaknesses. This study challenged only one use of the informal reading inventory.

Observations on the Use of the Standard Behavior Chart

How effective was the Standard Behavior Chart as a research instrument? The Chart allowed visual comparisons of distributions, which had the same advantages over strictly statistical comparisons that a photograph has over a verbal description. The Chart also proved appropriate for comparing children's behavior frequencies. The celerations and distributions of celerations substantiated Lindsley's claims that learning is linear on the semilogarithmic scale and that human behaviors within and between people spread by the same multiple up as down. As a research tool, the Chart was very efficient. Although this study used both statistical and visual comparisons and drew celeration lines by both the freehand method and the linear regression formula, visual and freehand methods alone produced adequate information to formulate research conclusions. Finally, this study assumed from previous research that the frequencies were sensitive and specific enough to allow a comparative study between several curricula tried minutes apart. The results of this study confirmed this assumption.

A Prediction

Educators seldom question the use of high performance levels for reading instruction or the use of traditional statistical research techniques. This study challenged both. The findings and techniques described in this study deserve careful evaluation. If substantiated, they could revolutionize current research and teaching practices.
REFERENCES


Karen Neufeld is Associate Professor of Education, Tabor College, Hillsboro, Kansas 67063. Ogden Lindsley is Professor of Education, Bailey Hall, Kansas University, Lawrence, Kansas 66045.
The Center for Individualized Instruction was an Advanced Institutional Development Program (AIDP) grant-funded unit whose function was to use the best of modern instructional technology to develop and offer some exemplary individualized courses at Jacksonville State University.

The general method of teaching used at the Center grew from the work of B. F. Skinner (1968) and the application of operant conditioning to teaching. Human behavior was seen as a lawful function of its environment, and the problem of teaching was to control relevant aspects of the teaching environment so that the appropriate behaviors were learned in the quickest, most efficient and humane manner. Courses were generally organized in the Personalized System of Instruction (PSI) method (Keller, 1968) using self-pacing and repeated testing over a given unit of material until mastery was demonstrated. Other undergraduate students served as proctors who provided immediate feedback on exams, personal attention, and discussion of missed test items.

Microprocessors were used in some courses to provide computer-assisted instruction (CAI), academic exercises, and tests. The computers precisely timed the student activities and kept permanent records of performance.

Measurement of academic activity at the Center relied on the work of Pennypacker, Koenig, and Lindsley (1972), White and Haring (1976) and their associates. Tests and exercises were timed, although there was no time limit, and frequency of correct and incorrect responses per minute were plotted on Daily Standard Behavior Charts. The Charts provided graphic assessment of the position and daily progress of each student.

All of these elements functioned within an ongoing flow of educational activity as a system which provided and fed-back the data needed to improve. Following are expanded discussions of the components of the system, and examples of some of the data generated.

SYSTEM DESCRIPTION

Course Management. Courses housed at the Center used the basic PSI model (see also Ruskin, 1977; Sherman, 1977; Taveggia, 1977). Each course was divided into a set of well-defined units presented sequentially, some with review units. Generally a standard textbook formed the central curriculum element for Center courses. Combinations of slide/tape,
video/tape, audio/tape, small discussions, live laboratory exercises, CAI exercises, workbooks, and lectures provided supplemental information. Both commercial and locally produced materials were used. A syllabus or course policy statement outlined the procedures for each course. Courses presenting a great diversity of elements also provided extensive study guides with flow diagrams to direct students into the activity appropriate for their level of attainment at that time.

The students began by studying the material for Unit One. When ready, students presented themselves individually for testing on Unit One. Immediately following the test, the students met with advanced-student advisors for discussion of the concepts presented in the focusing on the concepts missed.

Mastery criteria were specific to each course and were defined as percent correct (usually 80-90 percent). If students demonstrated mastery of the material, they proceeded to the next unit; if not, they restudied and later took another test. Some courses arranged for multiple forms of each test, while others selected a new stratified random sample of items for each test.

The elements of this arrangement worked together as a system. Study guides and the curriculum presentations provided the concepts to be learned. The self-pacing feature permitted the well-intentioned students who had minor gaps in a unit's background to spend the extra time needed to adequately prepare for that unit's test. The mastery requirement insured that the students had learned the crucial material in that unit before proceeding to the next. The unlimited retest component made each test a motivational tool, as well as an evaluation instrument. When a unit test was failed, the potential reinforcer of a good grade was still available, since only the highest unit tests counted for grades. The student advisors individually discussed the tests with the students, giving immediate feedback and covering the points that were not mastered. As peers, the advisors explained concepts in the student's language and interacted with the students in a friendly and personal way.

Microprocessors. Six Apple II microprocessors with floppy disks used the BASIC or APPILOT II language to present test items interactively for three courses using the "concealed multiple choice" (Bowles, 1977), or the fill in the blank format. In concealed multiple choice, a question was presented followed by the first randomized foil, to which the student responded with a yes or no, corresponding to true and false. The next foil was then presented and answered. The student was given feedback as to which responses were correct. The microprocessor randomized the selection of items and foils, and recorded the number of correct and incorrect responses, the test time and the latency of each response.

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2Apple II is a trademark of the Apple Computer Co., Cupertino, Calif.

3APPILOT copyright 1978 by Silas B. Warner available from MUSE, 7112 Darlington Dr., Baltimore, MD 21234.
response. Percent correct was also calculated. The information was permanently stored for subsequent analysis.

**Precision Measures.** Student performance on tests was measured in two (2) ways: (1) frequency of correct and incorrect responses per minute, and (2) percent of correct responses. The frequency measure was used to monitor and improve student performance and learning, while the percent measure indicated current performance in relation to the mastery criterion.

Although there was no time limit, the tests were timed. The advisors plotted frequency correct and incorrect as well as the record floor on Daily Standard Behavior Charts (Pennypacker, Koenig, Lindsley, 1972; White & Haring, 1977). The resulting graphic display took the advisor about 20 seconds per test to plot because the "Frequency Finder" method was used instead of a table or manually dividing count by time.

After a few tests in a given unit, any student's Chart could be inspected and tentative celeration lines drawn through the frequencies--correct and incorrect. Projecting celeration lines indicated immediately whether the student was making rapid enough progress. A change in the student's behavior was seen as either frequency change or a change in celeration (slope), and provided an estimate of the extent to which the teaching environment controlled the behavior. Thus, each unit formed a set of repeated measures that allowed experimental tactics to be evaluated. Chart 1 shows one student's performance and learning on chapter tests in a Human Physiology course in Fall, 1979. Frequencies plotted between the day lines indicated more than one test taken per day. As shown in Chart 1, the instructor intervened with a discussion of efficient study techniques and student progress on day #38. Notice that in the first 35 days of the semester, (before the intervention) she completed only 1 chapter. Following the intervention, she completed the remaining 9 chapters in only 64 days.

While statistical measures for the above elements were possible (see Pennypacker, Koenig, Lindsley, 1972; White & Haring, 1977; Koenig, 1972; Pennypacker, 1976a, 1976b), visual assessment was generally used for its speed and ease. Also, since these measures were absolute, direct, independent, and continuous, other advantages accrued. Since frequency was an absolute and direct measure like the meter, as opposed to an indirect or statistical measure dependent on the observed variability of the sample at hand, Charts from all courses at the Center (or anywhere else) could be directly compared. As frequency (as opposed to percentage) was an independent measure, there was no necessary linkage between frequency correct and frequency incorrect. Thus, intervention could be directed at reducing one or increasing the other, depending on circumstances. As frequency was continuous, the minimum change in a student's performance that could be measured was not determined by the number of test items, as were percents, but depended on the accuracy of the clock used. (For a more complete discussion of these points, see also Pennypacker, 1976a, 1976b)
Chart 1: One Student's Performance and Learning on Chapter Tests in a Human Physiology course

Volume I, Number 1, April 1960.

in a University Center. Journal of Precision Teaching.

Mathuriz, Charles J. and Glauzer, Charles P. Precision Teaching.
Operating Statistics. The Center had a full time staff of two, an instructor for each course, and a fluctuating staff of student advisors working for credit, money, or recommendations. Twelve (12) sections of 8 courses were physically housed in a 1400 sq. ft. facility open from 8-4:30 weekdays (see Table 1). Chart 2 shows the total number of tests taken per day by all students in all courses and by 42 students enrolled in Biology 102 (16 units) during the first 5 weeks in 1980.

<table>
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<th>1979</th>
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RESEARCH

The system described was self-improving in the long term, as it provided a basis for instructors to test their notions of how students learn. Work under way in one semester included an attempt to use the power of Charted direct measures to investigate the use of sophisticated logical strategies and an effort to measure the effect of feedback-timing on performance and retention in multiple-choice testing.

Another investigation involved the use of a prediction of the course completion date as a pacing device. While the program used a computer, it was a straightforward conversion of an operation that can be done simply on the Chart. The student accessed an on-line computer program. The machine calculated the average number of days the students had spent per unit passed, multiplied this by the number of units in the course, and projected the calendar date for completion of that course. The program was initiated at selected points in the semester in various courses. The effect of this pacing device on actual completion date, units completed per day per week and units attempted per day per week were assessed and reported in Merbitz, Olander and McDade (1980). Chart 3 shows the effects of the pacing device on one student enrolled in Biology 102. On day #26, the student was exposed to the pacing program and participated in a discussion with her instructor. At that time, the projected course completion...
Chart 2. Number of Tests Taken Per Day

All Center Courses
BY 102 Only
Chart 3. The Effects of a Pacing Device on Projected Course Completion

Pacemitz, Charles T. and Olander, Charles P. Precision Teaching, Volume 1, Number 1, April, 1980.
date was Nov. 13, 1980, or 312 days into the semester. After the intervention the student rapidly completed 6 additional units such that her projected completion date became March 6, 1980, or only 60 days after the beginning of the semester.

OUTCOMES

Using these technologies has improved the product, behavior change of students, while making the courses effective and accountable. The effectiveness of the courses was demonstrated by the change in student behavior recorded from the beginning to the end of each unit and the number of units completed. Since costs to run a course can be found, a cost efficiency and effectiveness calculation based on student behavior change can be generated for fiscal and performance accountability (see Sexton, Merbitz, & Pennypacker, 1974).

Another effect of the system was to foster true equality of educational opportunity, in that the data permitted the student's work to be viewed objectively, separating it from any implied assessment of the student's worth or potential as a human being. In addition, since less skilled students entering the system were required to remedy deficiencies and reach a defined level of competence before progressing, they were not passed along with a low grade and an inferior superstructure of skills resting on a poor foundation. The repeated measures and teaching opportunities made sure that students spent the time needed and got the attention necessary for maximum progress.

The Charted performance data freed the instructors to teach by putting them in the position of managing learning, while the individualized nature of the system gave the instructors the power, flexibility, time and feedback needed to experimentally determine the appropriate conditions of learning for each student. The data also made it possible for students to find out which tactics were effective, and made it the student's responsibility to actually use those tactics. The union of the instructor and student in learning meant that instructors could do their best, most creative teaching with every student.

As a grant-funded organization, the Center is not available to instructors from other institutions. However, the Center staff is willing to share curricular materials and programs developed here and to encourage application of these technologies elsewhere.

REFERENCES


Pennypacker, H. S. The role of direct measurement in the evolution of a complex education system. L. E. Fraley and E. A. Vargas (Eds.), Proceedings of the third national conference on behavior research and technology in higher education. Gainesville, FL: Society for Behavioral Technology and Engineering, 1976a, 259-266.


Charles T. Merbitz is the Director of the Center for Individualized Instruction and Charles P. Olander is Associate Professor of Biology at Jacksonville State University, Jacksonville, Alabama 32235.
DATA-SHARING

HARD TO DO BECOMES EASY TO LEARN

Patrick McGreevy, Ph.D.
University of Missouri-Kansas City

A two-year screening and resource teacher project conducted by the author (McGreevy, 1978) found that "see-say words-count words correct" remediation tasks assigned to mildly handicapped students were 4x "easier to do," but 1.3x "harder to learn" than similar previously administered screening tasks. Even though the students learned these tasks at the rate of 1.2 per week, the author concluded that remediation efforts had been ineffective. He suggested that the results offered three (3) learning opportunities:

1. TRUST THE CHILDREN— they do not need "easy to do" tasks to remain motivated.
2. TRUST YOURSELF— to help produce in students more learning than you thought possible and GET BACK TO THE CHART—a lower initial performance provides a greater opportunity for learning.

The present project involved one (1) eighteen year old moderately retarded boy and attempted to translate these learning opportunities into effective remediation. The student was assigned the following task: see-say the first 25 words of Wilson's Essential Vocabulary. One-minute timings were conducted daily, followed by 10-minute practice sessions. During the timings and practice sessions, the student was encouraged to see-say words as quickly as possible, including incorrect responses, rather than skipping. Following each incorrect response, the correct word was supplied by the author and repeated by the student. Frequencies correct and incorrect were charted daily on the Standard Behavior Chart and shared with the student (see Chart 1). The author encouraged the student to "best his best ever" and improve his learning picture, that is, "corrects going up" and "incorrects going down." The first day's frequencies indicated that the task was very "hard to do" (/19 frequency multiplier). However, Chart 1 shows a "crossover to steep " learning picture, with corrects accelerating at 1.6 and incorrects decelerating at 1.2, indicating that the task was made "easy to learn."

These results suggest that, while "easy to do" tasks may give the impression of remediation, they leave little room for learning. Effective remediation should begin with "hard to do" tasks that provide room for greater learning.
Chart 1. A /19 Frequency Multiplier Becomes a "Crossover to Steep Jaws"

Patrick McGreevy is Director of Research and Exemplary Services, University Affiliated Facility for Developmental Disabilities, University of Missouri-Kansas City, 1080 East 63rd Street, Kansas City, Missouri 64110.

STEPPING AHEAD RESULTS IN IMPROVED LEARNING

Jim Johnson and Jean Jackson
C.O.F. Training Services

Using a severely deficient learning channel, see-say, and guided by chart-based instruction, simple remediation techniques were used with a twenty-four-year-old mildly retarded woman. Letters of the alphabet were flashed for one minute each day. Speed was encouraged during the timing. A four to five minute remediation period followed each such timing.

Over a six week period, a slightly improving "Jaws" learning picture was shown (see Chart 1). The task was then changed, stepping up from 26 letters to 24 survival words (go, stop, hello, etc.). This resulted in a greater opportunity to learn and a significantly improved "cross-over to Jaws" learning picture.

The result of improving learning by stepping this person ahead in the curriculum prompted us to move others ahead whose learning pictures were maintaining. Fifteen (15) clients having 2 learning pictures each had produced so more than 6 "Jaws" pictures per two-week review. Six (6) review periods later (12 weeks) we produced 20 "Jaws" from a possible 39 learning pictures.

Jim Johnson is Adult Services Director, C.O.F. Training Services, Box 457, Ottawa, Kansas 66067. Jean Jackson is Program Coordinator, C.O.F. Training Services, Osage City, Kansas 66523.
Chart 1. Stepping Ahead Results in a Greater Opportunity to Learn and a "Crossover to Jaws" Learning Picture
THE EFFECTIVENESS OF TOOL SKILLS AND A HUNCH ABOUT
THE PERFORMANCE AND LEARNING OF RETARDED PERSONS

Jim Johnson
C.O.F. Training Services

These charted data were taken by the instructional staff of C.O.F Training Services, Inc., Ottawa, Kansas. Distributions plotted on the Chart show the number of correct digits written per minute. Two (2) one-minute timings were given in March, 1978, to a group of ten mildly retarded adults who had some computing skills. These timings were "writing digits-numerals in sequence" and "writing digits-basic addition facts." A range of 16 to 28 weeks of tool skill drills followed to increase the frequency of computing and writing. The median celeration during this period was x1.3 per week. In December of 1978 the same two timings were again given to the ten adults to check the durability of the tool skill drills. As seen on Chart 1, the median frequency of "numerals in sequence" increased by x1.6 and the median frequency of "basic addition facts" increased by x3.5.

The distribution at the far right shows one-minute performances of 45 seniors at Ottawa High School. These seniors were given the same basic addition drill sheet used with the retarded adults. Since the performances of both groups have a similar median and range, and since the group of 10 retarded adults can learn to compute and write at a median celeration of x1.3 per week, an obvious hunch arises: MANY RETARDED PERSONS CAN LEARN AND PERFORM AS FAST AS THEIR "NORMAL" PEERS; THEY ARE SIMPLY BEHIND AND HAVE FURTHER TO GO.

Jim Johnson is Adult Services Director, C.O.F. Training Services, Box 437, Ottawa, Kansas 66067.

REMEMBERING PEOPLE A MINUTE A DAY

Stephen Graf, Ph.D.
Youngstown State University

I have a hunch knowing and using a person's name multiplies the "warmth" of an interaction with that person. Seeing Ogden Lindsley lead a workshop in Precision Teaching, I noticed the sincere, direct, immediate effort he makes in finding out and using a person's name (Lindsley, 1978). After several years of unsuccessful attempts at learning names and faces of students in large classes of between 100 and 200 people, I finally started practicing three Precision Teaching strategies, and was rewarded with success. Four replications have convinced me of the method's usefulness. The strategies used were: (1) pinpointing learning channels; (2) practicing a minute a day; and (3) encouraging high initial error frequencies.
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Mentally Retarded Adults
High School Seniors

Chart 1. The Effects of Tool Skills and a Comparison of "Retarded" and "Normal" Digit Writing

JOHNSON MENTALLY RETARDED ADULTS AND HIGH SCHOOL SENIORS SEE-WRITE
C.O.F. TRAINING SERVICES OTTAWA, KANSAS
Two learning channels pinpointed were "Sees person/Thinks name" (Chart 1) and "Sees name/Thinks face" (Chart 2). Twice a week during class while the students are taking a test, I look at each student present and try to think first and last name. Chart 1 illustrates the results of this effort. Several other behaviors that divide my time seem to have kept my people-named-per-minute at about 10 at the end of the quarter. More accurate timing may be in order.

Outside of class, I use my seating chart, a counter, and a stopwatch to practice visualizing the person as I look at his/her name. Results of these efforts are shown in Chart 2.

The minute a day strategy comes into play in a relative fashion. When one faces a mass of people, there's a tendency to believe that a "mass" of time is necessary to learn their names and faces. Other more necessary and immediate activities win our attention. The two to three minutes necessary to run through my seating chart, however, isn't that much of a strain on my daily behavior.

Exposure to Learning Pictures and the ensuing encouragement of high initial error frequencies helped overcome my feelings of hopelessness in the face of the multitude. Charting my progress gave me faith in the future. In fact, trend-following celebrations of "hit" frequencies in both learning channels (Charts 1 and 2) show the highest celebrations in the first two weeks, when I "needed" them most.

REFERENCE

Lindsey, O. R. Workshop in charting and projecting multiple baselines. Presented at The Pre-Convention Institute, Association for Behavior Analysis, Chicago, May, 1978.

Stephen Graf is Associate Professor of Psychology, Youngstown State University, 410 Wick Avenue, Youngstown, Ohio 44555.
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Journal of Precision Teaching

STANDARD GLOSSARY AND CHARTING CONVENTIONS
(first draft—April, 1980)

Accelerating 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.

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.

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

Behaver—person whose behavior is displayed on the Chart.

Behavior Floor—the lowest daily frequency possible for a particular behavior; l/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 Multiplier—value by which one celeration is multiplied or divided to obtain a second.

Change Day—first day of a phase change; symbolized by drawing a vertical line covering that day line on the Chart.
Counting Period Ceiling—the highest frequency observable under a given counting procedure; symbolized by drawing a dash line on the Chart connecting the Saturday and Monday lines.

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

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


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

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.

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

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

Frequency Line—horizontal line on the Chart.

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

Frequency Multiplier—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.

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 frequency distributions; symbolized by drawing a "<" on the Chart.

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

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

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

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

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

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 behavior's environment in an effort to improve the behavior being measured.

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

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

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

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

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

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

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

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