learning screening manual. **Columbus, Ohio: Charles E. Merrill, 1980.**

Lovitt, T. C., & Hansen, C. L. Round one—Placing the child in the right reader. **Journal of Learning Disabilities,** 1976, **9,** 347-353.

Precision Teaching Project. (Available from Skyline Center, 3300 Third Street Northeast, Great Falls, Montana 59404)

Regional Resource Center Diagnostic Inventories (Project No. 472917, Contract No. OEC-0-9-472917-4591 [608]). Eugene: University of Oregon, 1971.

SIMS Reading and Spelling Program (3rd ed.). Minneapolis: Minneapolis Public Schools, 1978.

Starlin, C. M. Evaluating progress toward reading proficiency. In B. Bateman (Ed.), **Learning disorders.** Vol. 4: **Reading.** Seattle: Special Child Publications, 1971.

Starlin, C. M., & Starlin, A. **Guides to decision making in computational math.** Bemidji, Minn.: Unique Curriculums Unlimited, 1973. (a)

Starlin, C. M., & Starlin, A. **Guides to decision making in oral reading.** Bemidji, Minn.: Unique Curriculums Unlimited, 1973. (b)

Starlin, C. M., & Starlin, A. **Guides to decision making in spelling.** Bemidji, Minn.: Unique Curriculums Unlimited, 1973. (c)

Wolking, W. D. **Rate of growth toward adult proficiency: Differences between high and low achievement children, grades 1-6. Paper presented at the International Symposium of Learning Disabilities, Miami Beach, October 1973.**

Cecil D. Mercer is a professor of Special Education, University of Florida, Gainesville, Florida 32611. Ann R. Mercer is an educational consultant in Gainesville, Florida. Susan Evans is also an educational consultant in Pensacola, Florida.

CAN LEARNING OR VARIABILITY BE PREDICTED FROM LOW INITIAL PERFORMANCE: IMPLICATIONS FOR PRECISION TEACHERS AND EQUAL INTERVAL CHARTERS?[1]

Patrick McGreevy, James G. Thomas, Lynette Lacy, Steven Krantz
University of Missouri-Kansas City UAF

Christine Salisbury
State University of New York at Binghamton

In 1972 Koenig used collections of final frequencies in all six cycles of the Standard Celeration Chart to establish the independence of frequency, celeration and bounce. Since that time, Precision Teachers have been using these standard measures of performance, learning and variability to make Chart-based decisions regarding their students' instructional programs.

For several years, Precision Teachers charted students' performance, while continuing to implement traditional public school curricular strategies. These strategies produced initial accuracy ratios (Pennypacker, Koenig, & Lindsley, Note 1) ranging from x5 to x50 and subsequent average celerations of approximately x1.2 for corrects and /1.2 for incorrects (McGreevy, 1978; Sokolove-Goettel, 1976; Wood & Ramsay, 1975). In other words, initial correct performances were relatively high with very few incorrects, while subsequent learning was relatively low.

In 1978 Lindsley began to question the effectiveness of curricular strategies that emphasized high initial performance and apparently provided less opportunity for learning. This questioning influenced the work of McGreevy (1978, 1980, 1981), Stromberg and Chappell (1980) and others.

McGreevy (1978) compared the initial correct performance and learning of a group of elementary school children on similar screening and remediation tasks. He found that screening tasks administered daily for 10 days without instruction produced lower initial correct frequencies and higher correct celerations. He concluded that the remediation efforts were relatively ineffective.

In 1980 McGreevy demonstrated low initial

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performance followed by rapid learning in a moderately retarded young man. The initial accuracy ratio was /19, while the subsequent celerations were x2.6 for corrects and /2.6 for incorrects. McGreevy (1980) suggested that low initial performance provided a greater opportunity for learning. McGreevy (1980, 1981) also suggested that "hard to do" (low initial performance) may not necessarily mean "hard to learn" (subsequent slow learning).

Stromberg and Chappel (1980) attempted to teach an entire second grade class a math curriculum at a pace suggested by the adopted text. Pairing this text with Precision Teaching for 4 months and 4 phases of instruction resulted in initial accuracy ratios ranging from x1 to x65, most of which included no errors. The median correct celeration was x1.4, while the error celerations were almost all x1.0. After 4 months, the investigators changed the task for all children. The new task included all the math operations introduced in the second grade text. This "leap up" in the curriculum produced lower initial performances and more rapid learning. The initial accuracy ratios ranged from x6 to /1.6 and included many errors. The correct celerations ranged from x1.5 to x2.7 with a median celeration of x2.0. The error celerations ranged from /1.6 to /8, with a median celeration of /2.4. In other words, the new task was "hard to do," but proved to be "easy to learn."

Several other investigators examined "hard to do" tasks and subsequent learning. Bower and Orgel (1981) generated high initial error frequencies in college students that were frequently followed by high correct and error celerations. Eaton and Wittman (1982) tested the "leap up" strategy with three handicapped students. Prior to implementing this strategy, all the students' initial performances were high and errorless, with accuracy ratios ranging from x8 to x40. Their subsequent learning was relatively slow, with correct celerations ranging from /1.4 to x2.0. The incorrect celerations were all x1.0. After implementing "leap ups," all initial performances were considerably lower, with accuracy ratios ranging from /4 to /30. The subsequent learning for all students was rapid, with correct celerations ranging from x2.5 to x10 and incorrect celerations ranging from /1.6 to /4.5.

The "leap up" or "hard to do" initial performance strategy represents a major departure from the pace of instruction suggested by most educators and publishers. The preliminary work of the aforementioned investigators indicates that this strategy results in greatly increased student learning. As this strategy continues to be tested, it is important to examine closely initial performance to determine if relationships exist between this dimension of behavior (Johnston & Pennypacker, 1980) and subsequent learning and variability. The present investigation extended the work of Koenig (1972) by comparing low initial performances relative to the counting period floor to subsequent learning and variability. These comparisons were conducted with data charted on the Standard Celeration Chart. The present study also compared low initial correct performances to subsequent correct learning charted on equal interval charts. All comparisons were designed to determine if some degree of "leap up" or "hard to do" was related to subsequent learning or variability and were seen as having implications for Precision Teachers and Equal Interval Charters.

Method

The first author was commissioned by the Missouri Department of Elementary and Secondary Education to conduct a pilot study designed to investigate the effect of length of instructional time and time of day on rate of acquisition. Data collected in the course of that study also served as data for the present investigation.

Subjects

Twenty-four students enrolled in Missouri State Schools for the Severely Handicapped and their twelve teachers participated in the study. Teachers were selected based on their willingness to participate. Students were selected by their teachers without a systematic selection process.

Procedure

With the assistance of the investigators, each teacher selected from one to three tasks for two students. Each teacher was instructed to select tasks that each student would likely find "hard to do." Each teacher was also instructed to select and conduct a one, two or three minute daily timing on each task and record the correct and incorrect frequencies on a data sheet. If the initial accuracy ratio was $\geq$x1.0, the task was considered "easy to do" and a new task was selected. If the ratio was $\leq$/1.1, that is, more incorrects than corrects, daily frequencies were collected on that task during a four week period. After each timing, the teachers spent between 2 and 10 minutes teaching the student how to perform the task. Each teacher selected her/his own teaching strategies and how and when to change those strategies.

Results

At the end of the four week period, the frequencies for 66 tasks were plotted on Standard Celeration Charts and equal interval charts (see Charts 1 and 2). Three measures of initial performance displayed on the Standard

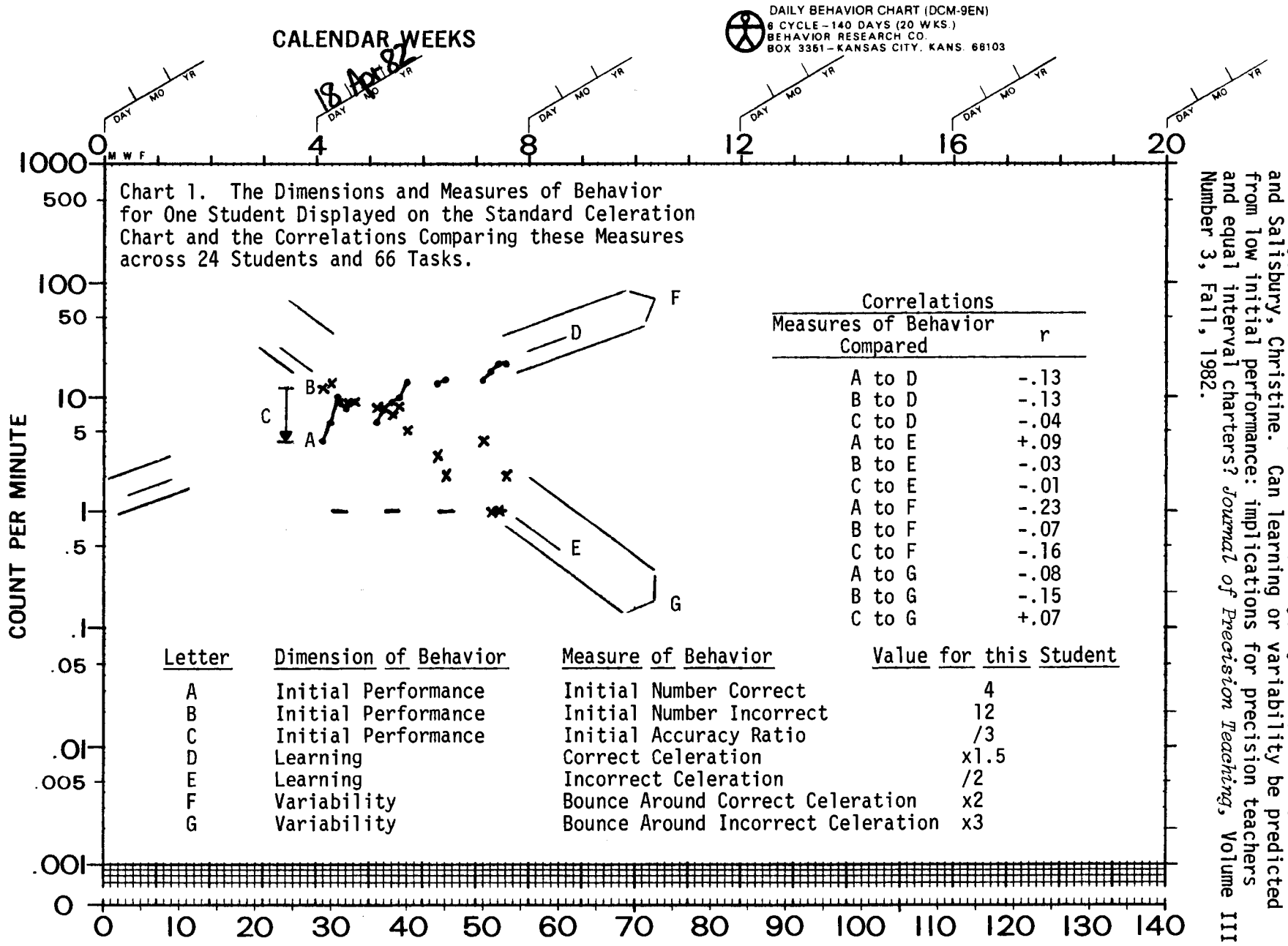

Chart 1. The Dimensions and Measures of Behavior for One Student Displayed on the Standard Celeration Chart and the Correlations Comparing these Measures across 24 Students and 66 Tasks.

Correlations	
Measures of Behavior Compared	r
A to D	-.13
B to D	-.13
C to D	-.04
A to E	+.09
B to E	-.03
C to E	-.01
A to F	-.23
B to F	-.07
C to F	-.16
A to G	-.08
B to G	-.15
C to G	+.07

Letter	Dimension of Behavior	Measure of Behavior	Value for this Student
A	Initial Performance	Initial Number Correct	4
B	Initial Performance	Initial Number Incorrect	12
C	Initial Performance	Initial Accuracy Ratio	/3
D	Learning	Correct Celeration	x1.5
E	Learning	Incorrect Celeration	/2
F	Variability	Bounce Around Correct Celeration	x2
G	Variability	Bounce Around Incorrect Celeration	x3

McGreevy, Patrick, Thomas, James G., Lacy, Lynette, Krantz, Steven and Salisbury, Christine. Can learning or variability be predicted from low initial performance: implications for precision teachers and equal interval charters? *Journal of Precision Teaching*, Volume III, Number 3, Fall, 1982.

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SUPERVISOR ADVISER MANAGER — C.S. BEHAVER — See-say AGE — vocab. LABEL — words COUNTED

Missouri State Schools for the Severely Handicapped

DEPOSITOR AGENCY — COUNTER — CHARTER

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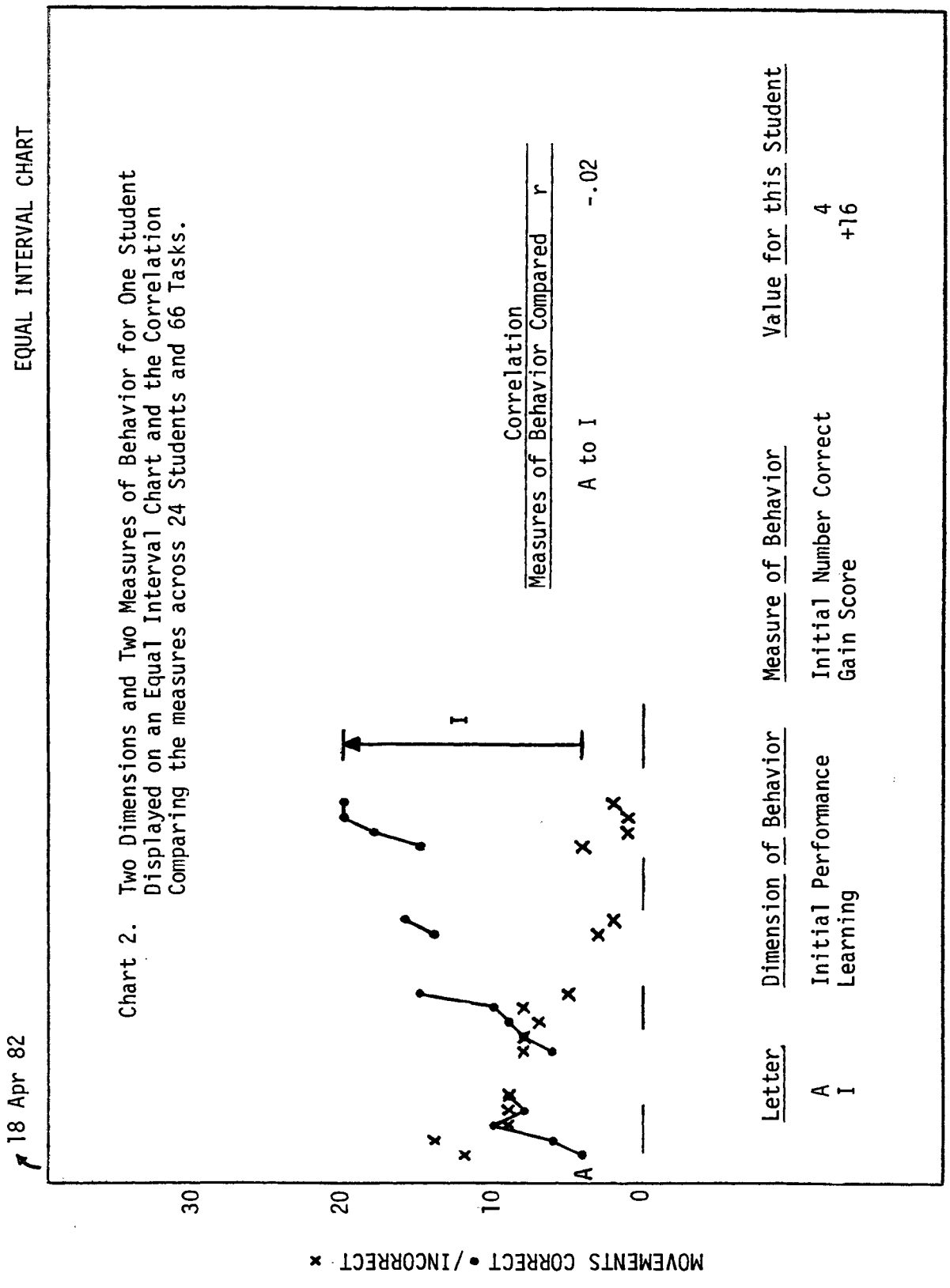

Celeration Chart were collected for each task: initial number correct, initial number incorrect and accuracy ratio. Since the timings (counting periods) were different for each task, and initial performance relative to the counting period floor was being examined, the initial number correct and incorrect were chosen as measures of initial performance. The initial accuracy ratio, the ratio between these two measures, was also used. The median and range of all three measures are shown in Table 1.

Table 1. The Median and Range of Three Measures of Initial Performance

Measure	Median	Range
Initial number correct	1 movement	0 to 15 movements
Initial number incorrect	9 movements	2 to 54 movements
Initial accuracy ratio	/6	1.5 to /28

Two-thirds of the initial number correct were either zero or one correct movement. One-third of the initial accuracy ratios were ≥/9, that is, between /9 and /28. These initial performance data indicate that the tasks ranged from "hard to do" to "extremely hard to do." These three measures of initial performance were compared to two measures of learning, correct celeration and incorrect celeration, and two measures of variability, bounce around correct celeration and bounce around incorrect celeration. All these measures were charted on Standard Celeration Charts. The initial number correct was also compared to one measure of learning, gain score. These measures were displayed on equal interval charts. All comparisons were conducted using Pearson product-moment correlations.

Chart 1 displays three dimensions and seven measures of behavior charted on the Standard Celeration Chart, the values of these measures for one student and the correlations comparing these measures across 24 students and 66 tasks. The correlations clearly indicate no relationship between initial performance and subsequent learning or variability. Chart 2 shows the same data for two dimensions and two measures of behavior plotted on an equal interval chart. Again, the correlations indicate no relationship between initial performance and subsequent learning.

Discussion

The data from the present investigation have implications for Precision Teachers and Equal Interval Charters. From the perspective of Precision Teachers, the data confirm that neither learning nor variability can be predicted from low initial performance, even when that performance includes few, if any, corrects and many incorrects. From the perspective of Equal Interval Charters, the data confirm that correct learning cannot be predicted from low initial correct performance. These data, along with the previous work of Koenig (1972), McGreevy (1978, 1980, 1981) Stromberg and Chappell (1980), Bower and Orgel (1981) and Eaton and Wittman (1982), suggest that the "leap up" or "hard to do" initial performance strategy should continue to be tested by Precision Teachers and Equal Interval Charters in a wide range of educational settings.

REFERENCE NOTE

1. Pennypacker, H. S., Koenig, C. H., & Lindsley, O. R. **Handbook of the Standard Behavior Chart.** Precision Media: Kansas City, Kansas, 1972. The initial accuracy ratio is the ratio of the initial correct frequency (or the initial number correct) to the initial incorrect frequency (or the initial number incorrect). This ratio is read on the Standard Celeration Chart as the distance from the initial incorrect frequency to the initial correct frequency.

REFERENCES

Bower, B., & Orgel, R. To err is divine. **Journal of Precision Teaching,** 1981, 2(1), 3-12.

Eaton, M., & Wittman, V. Leap ups: Acceleration of learning through increasing material difficulty. **Journal of Precision Teaching,** 1982, **3**(2), 29-33.

Johnston, J. J., & Pennypacker, H. S. **Strategies and tactics of human behavioral research.** Hillsdale, New Jersey: Lawrence Erlbaum Associates, 1980.

Koenig, C. H. **Charting the future course of behavior.** Kansas City, Kansas: Precision Media, 1972.

Lindsley, O. R. Personal communication, 1978.

McGreevy, P. **District-wide learning screening compared with average learning and learning picture products of resource teachers.** Unpublished doctoral dissertation, Kansas University, 1978.

McGreevy, P. Hard to do becomes easy to learn. **Journal of Precision Teaching,** 1980, **1**(1), 27-29.

McGreevy, P. **Teaching and learning in plain English.** Kansas City, Missouri: Plain English Publications, 1981.

Sokolove-Goettel, H. The first year of Project Product. Unpublished document, Shawnee Mission Public Schools, Shawnee Mission, Kansas, 1976.

Stromberg, G., & Chappell, M. Poster session at the Association for Behavior Analysis Fifth Annual Convention, 1980.

Wood, S., & Ramsay, S. The TCCSS learning bank. Unpublished document, Thurston County Cooperative Special Services, Olympia, Washington, 1975.

Patrick McGreevy is an assistant research professor and the Director of Client and Community Services for the University of Missouri-Kansas City UAF, 2220 Holmes, Kansas City, Missouri 64108. James G. Thomas is a graduate student in the Department of Psychology, University of Missouri-Kansas City. Lynette Lacy is the lead teacher of the University of Missouri-Kansas City UAF Preschool for Handicapped Children. Steven Krantz is an assistant professor and the Director of University-based Training for the University of Missouri-Kansas City UAF. Christine Salisbury is an assistant professor of special education at the State University of New York at Binghamton.

Chart-sharing

MONITORING THE USE OF A SPECIALIZED LIBRARY

Cori Brown and Beth Gibson
University of Missouri-Kansas City UAF

The University Affiliated Facility (UAF) at the University of Missouri-Kansas City has operated a library of print and non-print materials related to developmental disabilities since 1978. This library, referred to as the Technical Assistance Clearinghouse (TAC), provides materials upon request to persons interested in developmental disabilities. Beginning in January, 1979, monthly data were collected on the number of requests for materials and the number of items loaned. Until recently, these data were reported quarterly in tabular form. This material provided a look at the present status of TAC and a momentary look at changes in the use of TAC. In March, 1982, the Director of the UAF commissioned two staff members to take a closer look at the use of TAC over time. These two staff members decided to retrieve these monthly data and plot them on the monthly Standard Celeration Chart.

Chart 1 provides a continuous look at the use of TAC since monthly data were recorded. This Chart displays the number of requests for materials and the number of items loaned. The number of requests accelerated at the rate of X1.3 from January, 1979, through June, 1981. During this same period, the number of items loaned accelerated at the rate of X1.4. From Chart 1, it is evident that the use of TAC continuously increased for two and one-half years. Comparing the points at which the two celeration lines cross the first and last data months provides an additional conclusion: On the average, the number of items loaned per request doubled over this two and one-half year period of time.

Cori Brown is the Resource Coordinator and Beth Gibson is the Coordinator of Technical Services for the University Affiliated Facility (UAF), University of Missouri-Kansas City, 2220 Holmes, Kansas City, Missouri 64108.

DIGIT TYPING FOR MICRO-COMPUTER MATH PROGRAMS: TOWARD A DETERMINATION OF PROFICIENCY STANDARDS

Kenneth U. Campbell
Micanopy, Florida

Donna McCarthy-Jensen
Gainesville, Florida

The recent influx of micro-computers into the American classrooms has placed several pressing demands upon educational researchers and product-materials developers. A critical need exists for rate-based software, adequate promotion and marketing of the developed materials, a timing standardization for precision-teaching software, and the sharing of computer-generated data to determine present proficiency standards.