THE USE OF FREQUENCY IN ESTABLISHING INSTRUCTIONAL AIMS

Cecil D. Mercer
University of Florida

Ann R. Mercer
Educational Consultant

Susan Evans
Educational Consultant

To know when to introduce new skills, teachers must decide when students have mastered skills they are currently learning. In the field of Precision Teaching, criteria for mastery or proficiency are often referred to as instructional aims. These aims are usually defined in terms of correct and incorrect frequencies. For example, an instructional aim in reading might be 150 words per minute with 2 or less errors. Sometimes the incorrect frequency is not mentioned and assumed to be near zero per minute. These frequencies, charted on the Standard Celeration Chart, are sensitive measures of both accuracy and fluency. The latter is crucial because it is the discriminating factor between a student who is acquiring a skill and one who is fluent or proficient in that skill.

Several procedures have been used by Precision Teachers to determine proficiency. Lovitt and Hansen (1976) suggest using a percentage of improvement. For example, a child can progress to the next reading level (meaning he has attained mastery) when he has improved 25% over his baseline frequency in oral reading and when he answers comprehension questions with 90% accuracy.

Another method used to determine proficiency or instructional aims is peer comparison. Frequency data are collected from children who are achieving satisfactorily and their performance is used as an aim.

Normative data are also helpful in setting criteria for proficiency. A group of students perform a task and the mean correct frequency (or a higher percentile) is used as the mastery criterion for all students.

Another method of determining proficiency combines teacher performance and tool skill frequencies. Eaton and Hansen (1978) demonstrated a relationship between tool skill frequency and basic skill frequency. For example, a child who writes digits slowly (tool skill) will probably also write answers to math facts slowly (basic skill). An adult may write digits random at a frequency of 100 per minute and may write answers to math facts at a frequency of 75 digits per minute. A child may write digits random at a frequency of 60 per minute. Using a proportion formula

$$\frac{\text{child's frequency}}{\text{child's tool skill frequency}} = \frac{\text{adult's frequency}}{\text{adult's tool skill frequency}}$$

the child could be expected to write answers to math facts at a frequency of 45 digits per minute.

In the absence of frequencies that reflect standards of proficiency, or suggest instructional aims, the aforementioned procedures have been helpful. Although disagreement continues regarding proficiency standards, enough data are now available to suggest tentative proficiency levels or instructional aims for selected academic tasks. These data have largely resulted from several Precision Teaching projects (e.g., Koenig & Kunzelmann, 1980; Precision Teaching Project; Regional Resource Center Diagnostic Inventories, 1971; SIMS Reading and Spelling Program, 1978) and are based on an extensive sampling of student performance. The frequencies collected by these projects and various additional investigators are either suggested as proficiency levels or indicate the performance levels of high-achieving peers. Occasionally, wide discrepancies exist between early data and more recent data or major project data. When this discrepancy occurs, it is feasible to give the recent data or the project data more weight. This article presents current frequency data on selected academic tasks that suggest tentative proficiency levels and discusses implications for teachers.

Results

Suggested proficiency levels for academic readiness skills are presented in Chart 1. Three of the four investigators examined see-say lowercase letters random and see-say uppercase letters random separately, but each obtained identical frequencies for the two tasks. For this skill it appears that a useful proficiency level is in the range of 80 to 100+ letters per minute.

Two of the four investigators examined hear-write letters of the alphabet random. Proficiency level ranged from 80 to 110 letters per minute.

Two or more investigators examined hear-write numerals random, hear-say counting any sequence, see-write numbers random 1-5 and 0-9, and see-write letters random. Proficiency levels in these pinpoints have wide ranges. More data would be helpful.

CHART TRACER (CT-9EN)
BEHAVIOR RESEARCH CO
BOX 3351 – KANSAS CITY, KANS. 66103

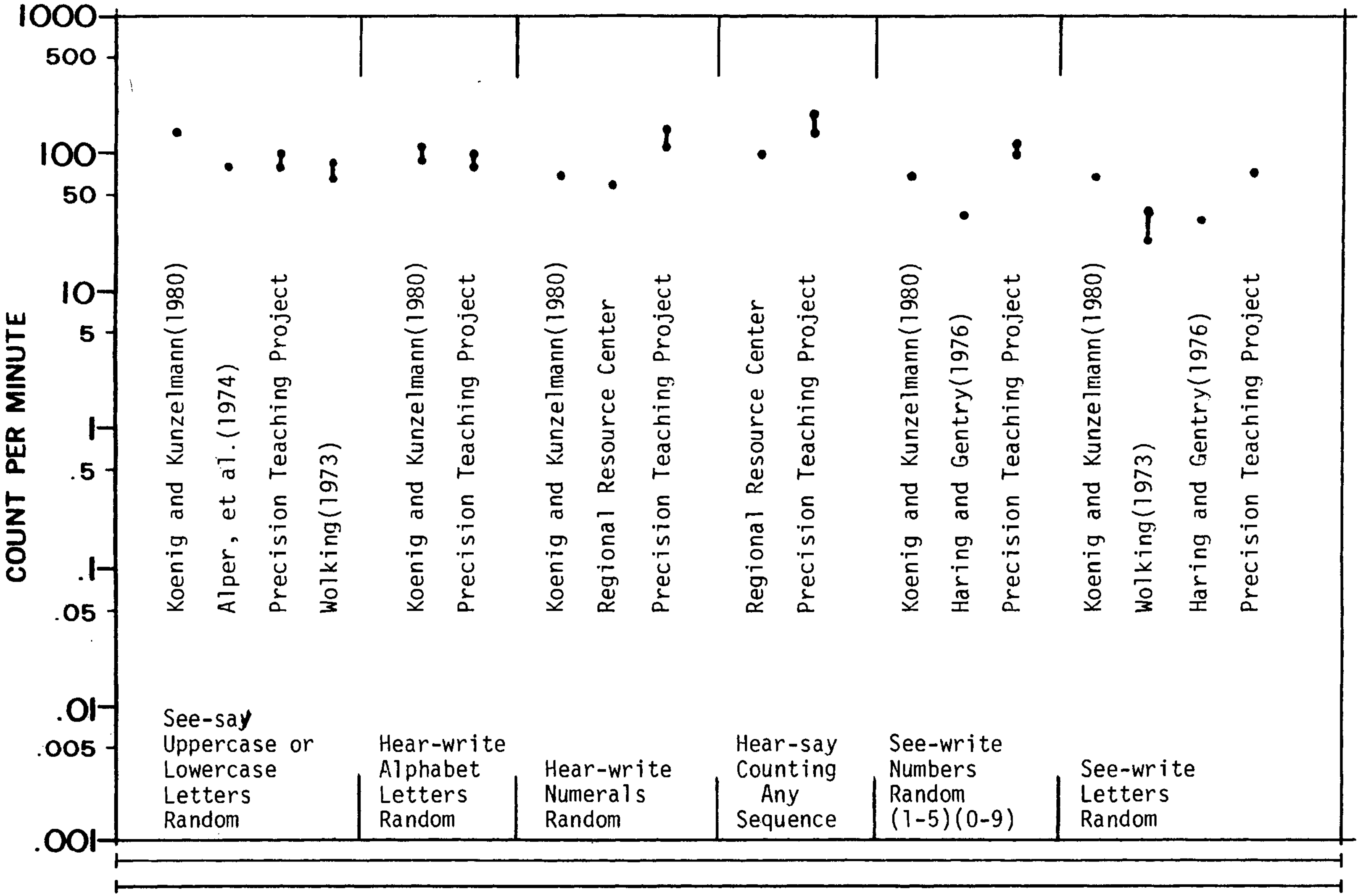

Chart 1. Suggested Proficiency Levels for Academic Readiness Skills

Mercer, Cecil D., Mercer, Ann R. and Evans, Susan. The use of frequency in establishing instructional aims. *Journal of Precision Teaching*, Volume III, Number 3, Fall, 1982.

letters, numerals or numbers

More data also are needed on numerous other pinpoints which were examined by only one investigator. These pinpoints were not presented in Chart 1 but include think-say numerals in sequence, see-say sets 1-5 and 1-9, see-say picture name, think-write first name, think-write numerals in sequence, think-count orally 1-10, and think-say alphabet.

Frequencies reported for reading skills are presented in Chart 2. Enough nonspecific grade level data are provided to suggest proficiency levels in each skill area: see-say isolated sounds (80-100 sounds per minute), see-say words in list (80+ words per minute), and see-say words in text (100+ words per minute). More data are needed in the graded skills (see-say words in list—grades 2-4) before proficiency levels can be ascertained.

Frequencies reported for math skills are presented in Chart 3. Enough data are reported to suggest proficiency levels in all of the graded tasks. It appears that the proficiency range for most math facts is 55-75 digits per minute.

Frequencies reported for spelling skills are presented in Chart 4. There are not enough data points to indicate proficiency levels in spelling; however, the ones included provide an initial frame of reference for spelling skills.

Certain learner characteristics, such as age, grade level, and achievement level, may influence the establishment of proficiency levels or instructional aims. Wolking (1973) sampled the performance (one-minute timings) of 740 individuals on numerous academic tasks. He noted that by the sixth grade the median child attained approximately 95% of adult accuracy and 65% of adult speed on the academic tasks.

Discussion

Correct and incorrect frequencies have been used to determine proficiency levels. Although this approach has yielded very helpful information, it may be beneficial to examine rate of growth or celeration to determine proficiency. For example, consider that a student celerates at a desirable rate on a task for a two-week period and then stabilizes. Once the learning levels off, it may be extremely difficult to produce a celeration which is worthy of the intense instructional effort. Thus, the leveling off frequencies of some students may indicate that the instructional aim is achieved, proficiency is reached and a new skill needs to be introduced. It is also possible that something else is interfering with the student's progress and a change in curriculum or consequences is needed. The situation is analogous to the runner who reduces his time in running the mile by two minutes in the first three weeks of training and from that point it takes six months to reduce his time by 15 seconds. Simply stated, if a reader achieves 100-150 words per minute, it may not be feasible to spend much more time trying to obtain 200 words per minute. However, it should be feasible to introduce more difficult reading material and strive for 100-150 words per minute again.

Since research has not conclusively determined proficiency standards for academic tasks, the teacher must use considerable discretion in setting aims with individual pupils in order to avoid overteaching and/or underteaching. As noted by Haring and Gentry (1976), the teacher should select aims that can be justified via empirical support or considerable experience.

Research on frequencies of specific skills is still in its infancy. Investigators are continuing to collect data on students of all ages and handicaps. These data may facilitate the development of improved methods for assessing and remediating academic deficits. Hopefully, proficiency standards that suggest instructional aims may also result from these investigations. When instructional aims become less arbitrary, efficient teaching and learning will occur.

REFERENCES

Alper, T., Nowlin, L., Lemoine, K., Perine, M., & Bettencourt, B. The rated assessment of academic skills. **Academic Therapy**, 1974, **9**, 151-164.

Eaton, M. D., & Hansen, C. L. Classroom organization and management. In N. G. Haring, T. C. Lovitt, M. D. Eaton, & C. L. Hansen, **The fourth R: Research in the classroom**. Columbus, Ohio: Charles E. Merrill, 1978.

Haring, N. G., & Gentry, N. D. Direct and individualized instructional procedures. In N. G. Haring & R. L. Schiefelbusch (Eds.), **Teaching special children**. New York: McGraw-Hill, 1976.

Haughton, E. Aims—Growing and sharing. In J. B. Jordon & L. S. Robbins (Eds.), **Let's try doing something else kind of thing**. Arlington, Va.: The Council for Exceptional Children, 1972.

Henderson, H. H., Clise, M., & Silverton, B. **Modification of reading behavior: A phonetic program utilizing rate acceleration**. Ellensburg, Wash.: H. H. Henderson, 1971.

Koenig, C. H., & Kunzelmann, H. P. **Classroom**

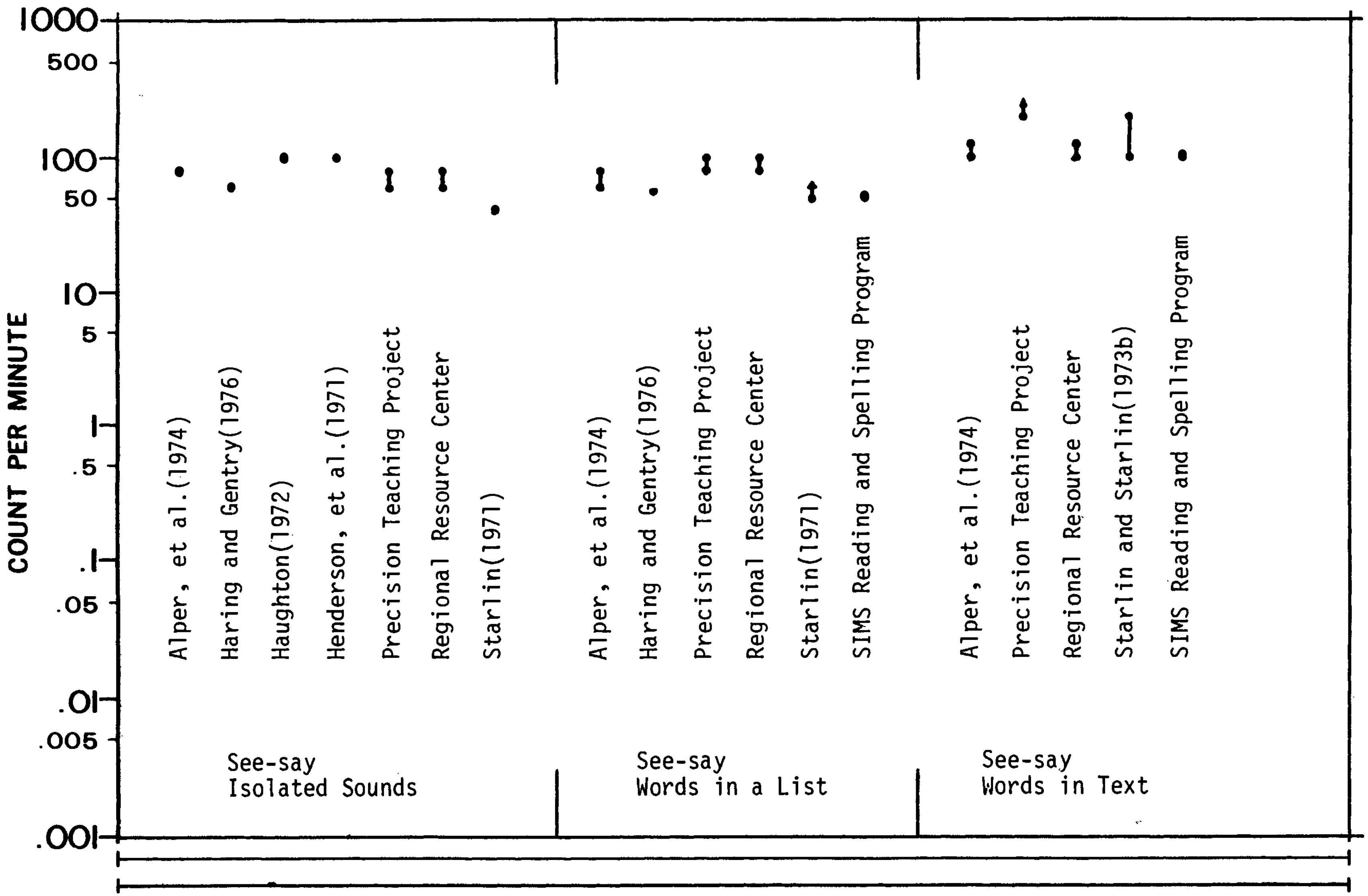

Chart 2. Suggested Proficiency Levels for Reading Skills

sounds or words

Mercer, Cecil D., Mercer, Ann R. and Evans, Susan. The use of frequency in establishing instructional aims. *Journal of Precision Teaching*, Volume III, Number 3, Fall, 1982.

Mercer, Cecil D., Mercer, Ann R. and Evans, Susan. The use of frequency in establishing instructional aims. *Journal of Precision Teaching*, Volume III, Number 3, 1982.

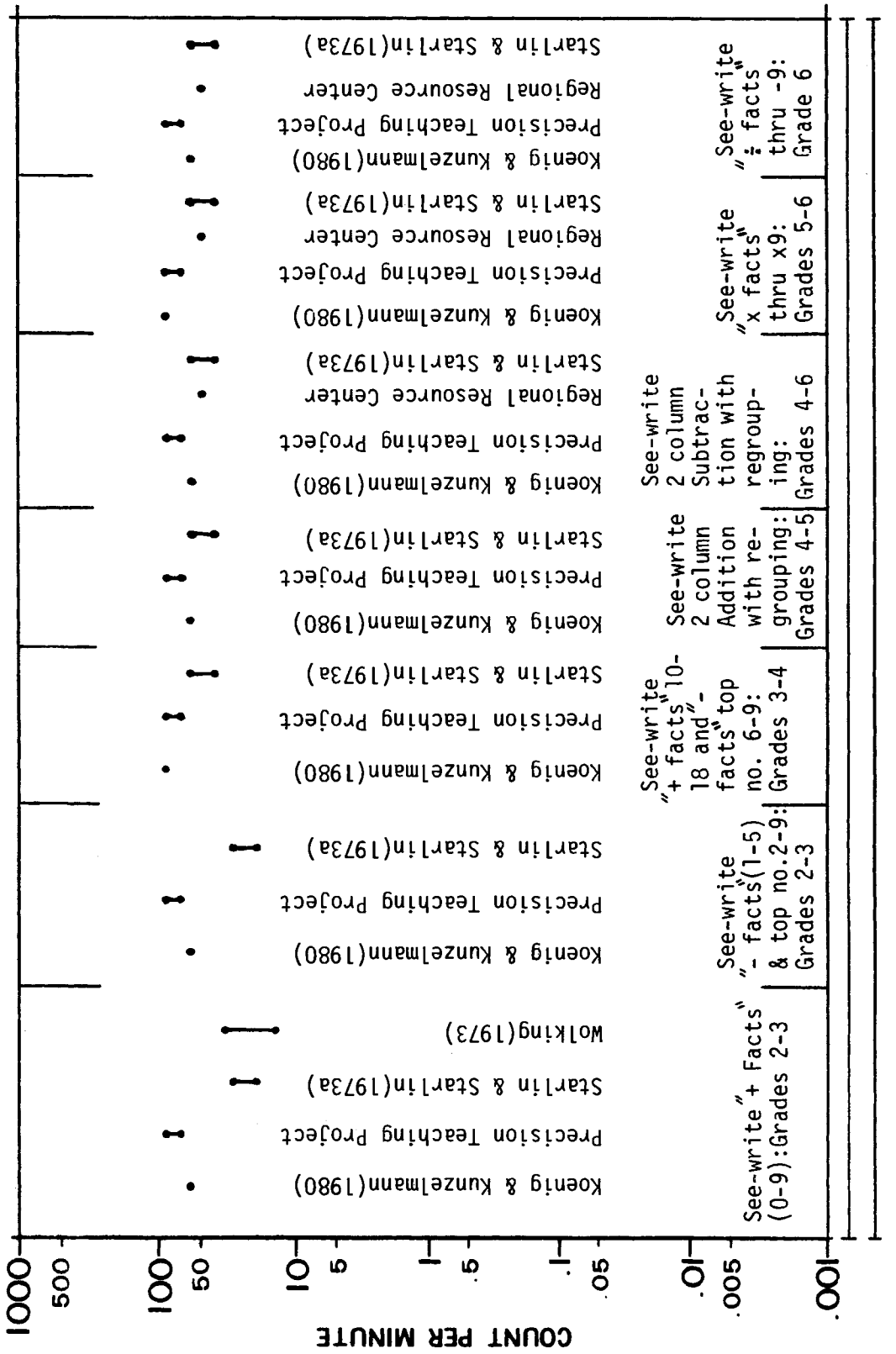

Chart 3. Suggested Proficiency Levels for Math Skills

Mercer, Cecil D., Mercer, Ann R. and Evans, Susan. The use of frequency in establishing instructional aims. *Journal of Precision Teaching*, Volume III, Number 3, Fall, 1982.

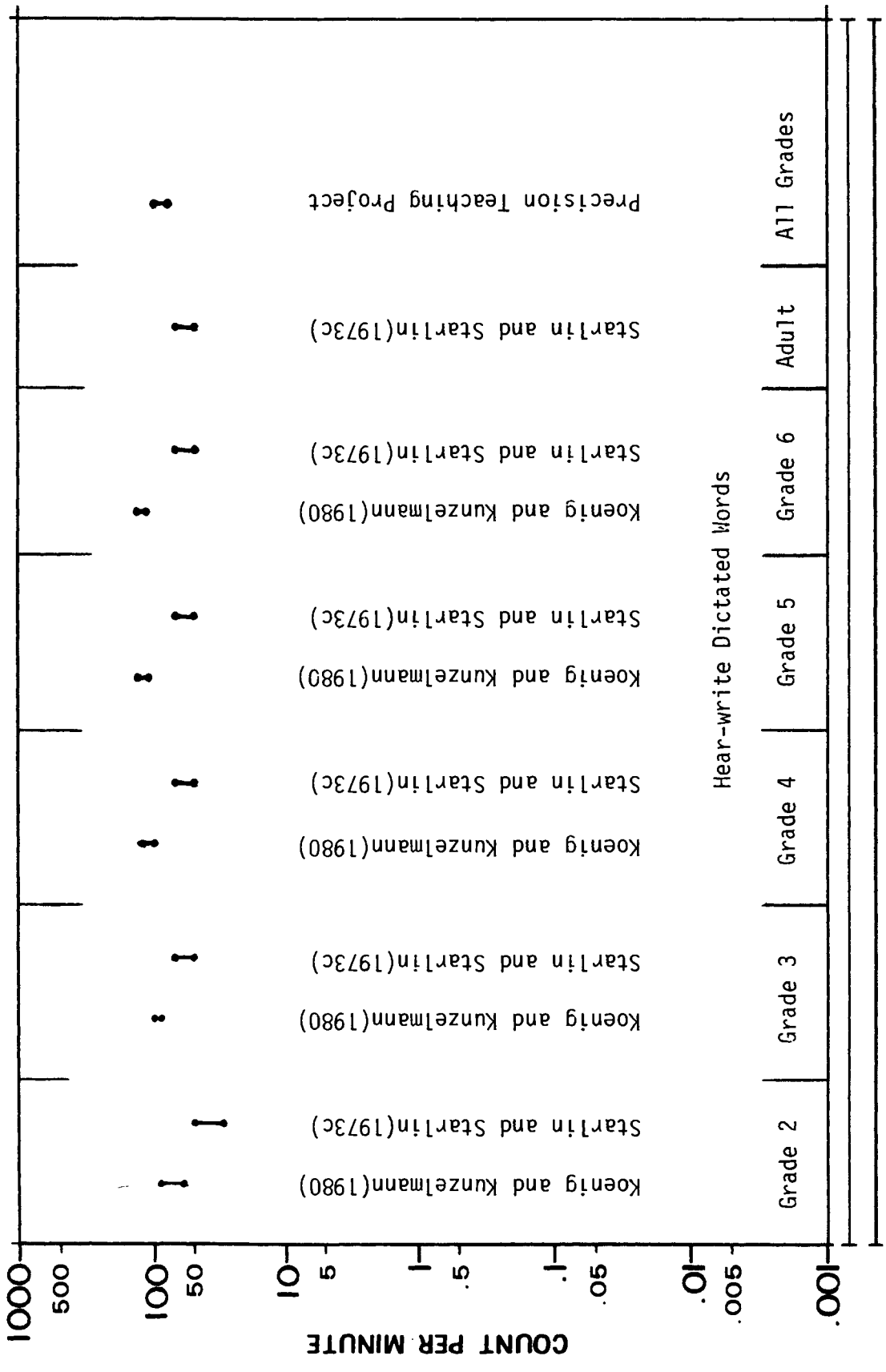

Chart 4. Suggested Proficiency Levels for Spelling Skills

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

---

[1]The authors wish to acknowledge the cooperation of John Heskett and Jim Friedebach of the Missouri State Schools for the Severely Handicapped.