

**SEVEN WAYS OF DESCRIBING READING—
McGUFFY'S AND SIX MORE:
PARTS III and IV**

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Abstract

A literature review reveals six traditional ways of describing reading with problems and confusions. Two describe the reading stimuli and four measure reading performance. A solution is to measure the teaching product, learning. Reading learning is measured by ratios and becomes the seventh way of describing reading. The review of the six ordinal methods plus the ratio way to describe reading has both historical and systemic value. The review is divided into four parts: (I) Lay categories, grade levels, readability formulas, rate, and accuracy; (II) Reading mastery levels; (III) Problems and confusions of the six measures and introduction to Precision Teaching, the seventh measure; (IV) Sixteen Precision Teaching picture components, discussion, and conclusions. The present article represents Parts III and IV of the review. Parts I and II appeared in Vol. II, Numbers 3 and 4.

PART III

Problems

The major problems in describing and measuring reading over the past 140 years have been: (a) there is little agreement between one measurement system and another (Chall, 1958; Felsenthal, 1973; Spache, 1964; Starlin, 1971), (b) the systems are mainly process oriented, too complicated, and too time-consuming for extensive classroom teacher usage; and (c) there is little that facilitates specific matching of a pupil with appropriate material (Chall, 1958, 1977; Spache, 1964; Starlin, 1971).

These problems do not imply that the work through the nineteenth century and the first three-quarters of the twentieth century has been entirely fruitless. It is important to be able to know these elements in order to revise the stimuli, when necessary. To know when to revise requires additional measurement.

Dolch, in 1928, stated, "Two books of the same size may have vocabularies about equal in extent, and yet the words in one may be more difficult for children than the words in the other. The problem is to measure this difficulty" (p. 173). Dolch vainly continued to examine the stimuli in search of the measure of response difficulty.

Just recently, Chall (1977) wrote, "It should be noted that none of the objective readability measures tells how difficult reading material should be" (p. 30). In fact, Chall is as concerned with how hard a book may be, as she is with whether or not it may be too easy.

The fuss over vocabulary control has created many word lists, readability formulas and still more basal reading series. Their narrowness and delimiting nature have been criticized.

Spache (1964) takes exception to the claim that a basal vocabulary is necessary as a foundation of all future reading. He cites three reasons which contradict that claim. First, it has been shown that average pupils who have advanced as far as the primer level learn many words other than the basal vocabulary and that their own speech vocabularies are far in advance of the concept level of basal readers. Second, there is no essential core or basal vocabulary except for a few hundred service words that recur frequently and universally. These are mainly prepositions, conjunctions, verbs, and adverbs. Spache (1964) elaborated:

Numerous studies of the vocabularies of various basal series show very little overlap. For example, a recent survey by Selma E. Her, cited by James M. Reid, found only six hundred words used in all of the twelve series studied, out of a total of approximately twelve thousand words. Furthermore, only 206 of the twelve thousand words were introduced at the same grade level in more than one basal series. Apparently each basal series has its own essential or core vocabulary which isn't even required to read common supplementary basals? (p. 81)

Third, the "new words" presented in the basals are not new to the children. Spache (1964) cited a study by Gates in which 300 third graders were tested on their knowledge of the third and fourth grade words found in their basal series. "On the average the pupils knew as many fourth grade as third grade words. Over half the pupils recognized 90% as many fourth grade words as they did third grade" (Spache, 1964, p. 81). Spache (1964) also cited a second study by Gates with second grade youths which revealed that about half of the total vocabulary had been prematurely learned by the poorest 10% of the readers.

Spache allows for a possible need for some vocabulary control at certain, early stages of learning to read and for certain pupils who exhibit very slow reading growth. McCracken

(1968) impassionately writes that large words need not be withheld from even these situations and pupils.

What we need are good stories, high-interest stories with exciting language and exciting words, stories which can be read and reread, drilled if you wish, because they are so good. Our able readers reread stories hundreds of times. We seem afraid to allow our poor readers this privilege. (p. 64)

McCracken elaborates upon how much more exciting longer, harder words can be and how dull shorter but perhaps easier words are. He then points out that teachers do not have to maintain the practice of presenting easy words.

We can note the affixes, the syllables, the vowels, the consonants. We can use these words, just as we can use any words, to learn about words. Since this is so, we might as well use interesting words rather than easy words. Easy words have never been easy for poor readers, perhaps because easy words are not interesting. (p. 65)

So we are still attempting to determine ease and difficulty of reading and in so doing the concepts of short words, long words, interesting words, etc., continue to enter the literature. Established procedures and beliefs become shrouded as mythology by conflicting evidence and their critics. The guidelines for improving the readability and learnability of our textbooks become weakened by the diversity of their products. Starlin (1971) states the issue well:

Because publishers are not standardized in their criteria . . . , it is difficult to know what book of what particular series would be most appropriate for a given youngster. Even knowing a grade level from the nonperformance-based achievement tests does not help, for the 2-2 book in one series may be considerably more difficult than the 2-2 book in another series. (p. 454)

But no matter what point of view, the pupils', the teachers', the educational specialists', the writers', the publishers', the researchers', the administrators', the parents', or the school patrons', empirical data are still lacking. Surveys yield momentary whims and biases. Various tests yield various results. Different textual series yield different grade levels. Different examiners label the same pupil performances with different labels.

Precision Teaching

Reading level and curricula debates will continue until a viable, compare-all, standard measurement system is used to resolve these questions.

The National Advisory Committee on the Handicapped (1977) recognized the need for "development of precise and uniform measures permitting reliable assessment of the impact of various programs and approaches" (p. 16). The Committee stated:

Such a system of measurement would bear the same relationship to communicating progress in special education that having a common tongue bears on creating greater understanding among people in disparate parts of the Nation. With it, improved practices not only could be clearly documented and displayed but could more readily be disseminated. Without it, each such gain must be translated into a variety of different measurement "languages." An important aspect of this work will be studies that specifically relate gains to the interventions that produced them, toward spelling out which interventions, under what conditions, are most productive, most cost-effective, and most likely to be applied, given the availability of the kinds of skills they require. (p. 16)

Precise Behavioral Management (PBM) measurement, known in the classroom as Precision Teaching (Jordan & Robbins, 1971; Lawrence, 1971; Lindsley, 1964; Kunzelmann, Cohen, Hulten, Martin, & Mingo, 1970; Pennypacker, Koenig, & Lindsley, 1972; White & Haring, 1976) is the seventh way of describing reading.

Comparison of the data reported in the reviewed articles shows that the most conclusive reading data were count over time. Lindsley's (Lawrence, 1971; Lindsley, 1964, 1972; Pennypacker, Koenig, & Lindsley, 1972) extension of frequency measurement to standard multiply-divide charting offers education not only a ratio measure of performance but at the same time a ratio measure of learning.

Frequency permits us to directly compare performance in two or more very different curricula. Ratio levels of measurement on the Standard Celeration Chart permit us to directly compare the learning in two or more very different performances. These concepts were previously ignored by education and the behavioral sciences.

Precision Teaching can be used in lieu of or in conjunction with the traditional methods of

curricular planning.

White and Haring (1976) recently advanced the following five phases of the learning process: acquisition, fluency building, maintenance, application, and adaptation. The words are basic English with reference to any standard dictionary revealing their distinctions.

The acquisition phase represents the initial "getting" of the skill basics, no matter how infrequent or rough the student's performance may be.

The fluency building phase refers to becoming more fluid with the skill to a point of smoothness and rapidity. For basic tool skills, such as saying words or writing numerals, the fluency phase begins when the correct frequency is 20 counts per minute with as many as 10 errors per minute. A 2:1 ratio is proposed for lower frequency behaviors.

The maintenance phase assumes adequate proficiency for more complex or advanced skills within the application and adaptation phases. However, such proficiency is not necessary to begin application and adaptation. These two phases can even feasibly begin during acquisition and run parallel with fluency building.

These concepts are not new. In 1917 Gray (p. 27) wrote, "The classes and the pupils who do not attain fluency in oral reading are usually slow, ineffective silent readers."

The formalized concepts, however, are useful for teachers. The independent reading level can include maintenance, application, and adaptation. The teaching step, depending upon one's definition of teaching, could include all five steps but certainly must include acquisition and fluency-building.

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PART IV

Precision Teaching shows performance "snap shots" of correct and error frequencies and provides for accuracy statements. Precision Teaching also shows dynamic, moving, learning pictures.

The performance measure and the learning measure applied to a reader's reading provide reading pictures and comprehension pictures. These pictures can be compared to other pictures, the reader's or peers', to determine rank, show progress, make decisions, or set standards.

The pictures are composed of nine components:

- (1) **Correct performance** counted and timed daily yields correct count/minute/day (correct frequency);
- (2) **Error performance** counted with the correct performance yields error count/minute/day (error frequency);
- (3) **Correct learning** progress is indicated by weekly celeration, which is determined by a "best-fit" line through 5 to 10 daily correct performance counts;
- (4) **Error learning** progress is indicated by weekly celeration, which is determined by a "best-fit" line through 5 to 10 daily incorrect performance counts;
- (5) **Performance accuracy** is measured by the vertical ratio distance between any correct and error performance pair showing corrects to one error (with conversion to percent possible, but not recommended); beginning accuracies and ending accuracies are teaching concerns;
- (6) **Changing accuracy**, technically called accuracy improvement multiplier, is shown by the spreading of the correct and error celeration lines; it is measured by the correct and error celeration quotient/minute/day/week (Pennypacker, Koenig, & Lindsley, 1972);
- (7) **Correct daily variance**, performance "bounce" around the celeration line, is the up and down ratio distances from the correct celeration line to the highest and lowest frequency; total correct bounce is the distance between the highest and lowest frequency around the correct celeration line;
- (8) **Error daily variance** is the bounce from and

around the error celeration line;

- (9) **Endurance**, measured by the recording time, shows the amount of time of the measure.

Chart 1 shows five reading pictures across the 1976 Spring semester of a first-grade pupil's Fry reading group lessons within his 30 minute reading instruction class in a resource room for pupils with learning disabilities. The 9 picture components described above can be seen in each of the five pictures.

Two more picture components can also be seen in Ron's Chart:

- (1) **A correct learning course projection** is beamed into the future by projecting the correct celeration line and its performance bounce forward; extending the correct celeration line of the 5th picture to the end of the chart projects the final correct frequency near 50 correct words per minute, with the width of the projected course extending from 20 to 60 correct words per minute;
- (2) **An error learning course projection** is beamed into the future by projecting the error celeration line and its performance bounce forward; extending the error celeration line of the 5th picture projects no errors within the minute's reading; decisions to change or continue a pupil's reading plan are made from the picture of these two projections.
As we go from one picture to the next, six additional picture components can be seen:
 - (1) **The correct frequency shift factor**, technically called a correct frequency multiplier, is the distance between the final correct frequency of the first picture and the beginning correct frequency of the next picture; in Ron's Chart all correct frequency shift factors are downward and show that each new reading lesson is 2 to 3 times "harder to do" (McGreevy, 1981);
 - (2) **The error frequency shift factor**, technically called an error frequency multiplier, is the distance between the final error frequency of the first picture and the beginning error frequency of the next picture; Ron's Chart shows upward error frequency shift factors, indicating that each new reading lesson was 4 to 6 times harder to get right;
 - (3) **The correct celeration change factor**, technically called the correct celeration multiplier, is measured by the angular ratio of change from the correct celeration line of one reading picture to the correct celeration line of the next reading picture; Ron's correct celeration line of X 1.5 in his second reading picture is X 1.1 steeper than his first picture

CALENDAR WEEKS

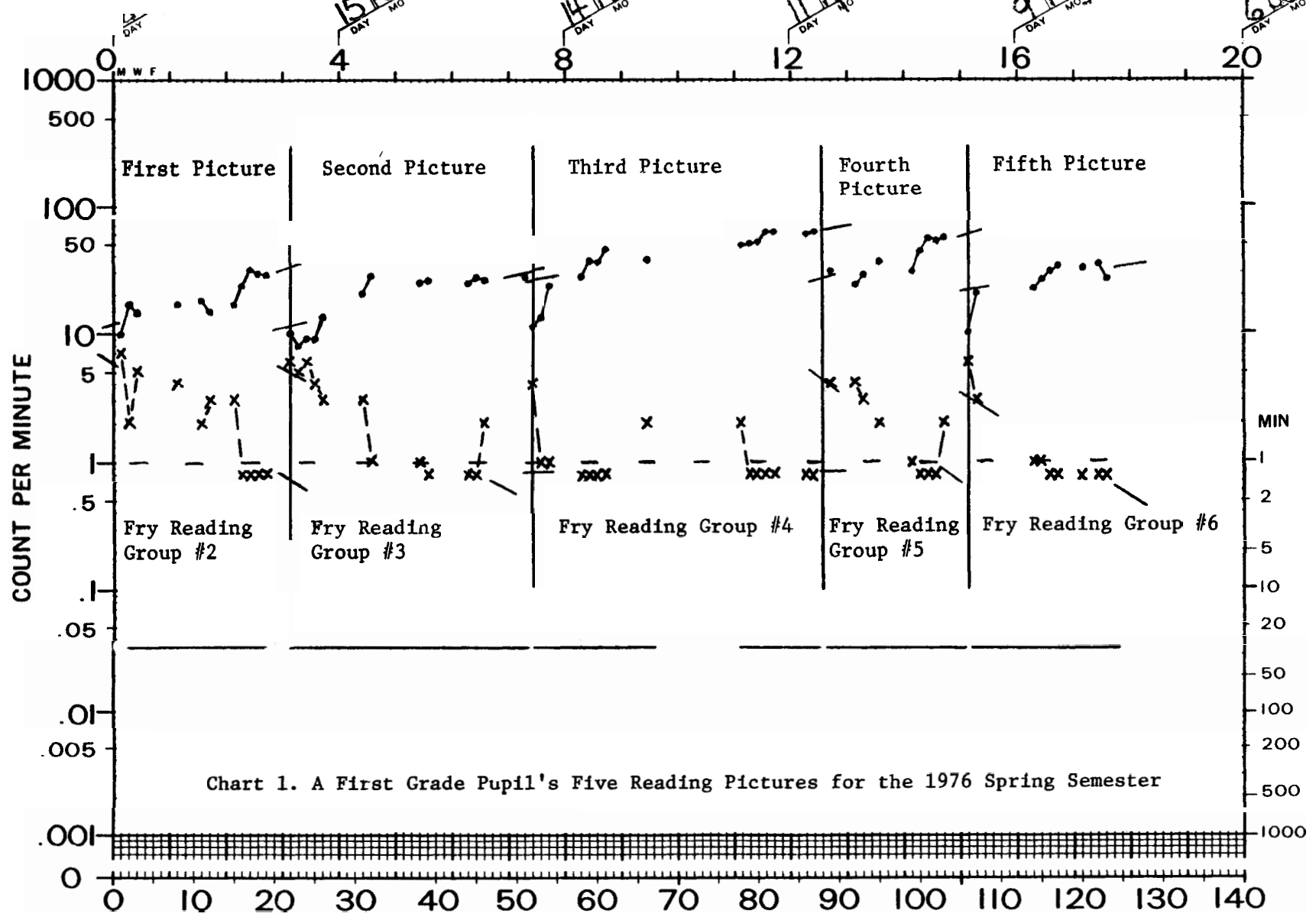


Chart 1. A First Grade Pupil's Five Reading Pictures for the 1976 Spring Semester

Neely, Malcolm. Seven ways of describing reading-- McGuffey's and six more: parts III and IV. *Journal of Precision Teaching*, Volume III, Number 1, Spring, 1982.

S. Wood	C. Priest	J. Anderson	SUCCESSIVE CALENDAR DAYS		Ron**	Gr. 1	says words	
SUPERVISOR	ADVISER	MANAGER			BEHAVIOR	AGE	LABEL	COUNTED
TCCSS, Olympia School District #111 Olympia, Washington					N. McRayde	**name changed to protect identity		
DEPOSITOR	AGENCY	TIMER	COUNTER	CHARTER				

correct acceleration line of X 1.4; in other words, Ron's correct word learning in the first picture was 1.1 times faster than his correct word learning in the second picture;

(4) The **error acceleration change factor**, technically called the error acceleration multiplier, is measured by the angular ratio of change from the error acceleration line of one reading picture to the error acceleration line of the next reading picture; Ron's error learning in the first two pictures is the same; the lines are decelerating at the same rate, /2.0; the third picture shows that learning new words or correcting mistaken words was essentially impossible as the error learning was X 1.0 with nearly zero errors; examining the error acceleration lines of the last two pictures shows that Ron was learning new words 1.2 times faster in the fourth picture;

(5 & 6) **Correct and error daily variance shift factors** are measured by the proportional changes of each picture's total correct and error bounce; Ron shows a fairly steady X 2.0 to X 3.0 correct bounce in each picture; the error bounce ranged from X 3 to X 8, yielding no exceptional error bounce shift factors.

Correct and error accelerations viewed together comprise a learning picture.

Lindsley (1977) suggested counting and charting various types of learning pictures to periodically monitor pupil, classroom, and program learning. He suggested using Weekly, Monthly, and Yearly Standard Behavior Charts.

All (1977), Sokolove (1977-1978), Shawnee Mission Schools (1978), and James White (1977) reported finding from 11 to 14 different learning pictures empirically useful in monitoring their classrooms and programs. All's (1977) pupils named the 11 learning pictures used in their classroom.

Four of Ron's five reading pictures in Chart 1 are the "jaws" learning picture named by All's pupils. McGreevy (1981) refers to these four pictures as "up to aim/down to zero." Ron's third reading picture is the "TR7" picture named by All's pupils. McGreevy (1981) refers to this picture as "up to aim/zero."

Chart 2 shows another jaws learning picture. The first two weeks of Vanessa's comprehension picture shows cross-over jaws. This is the best learning picture. Errors are initially greater than corrects, but both correct and error learning occurs so rapidly that steep acceleration lines cross each other and soon show favorable, final performances. Vanessa made her comprehension picture from 17 daily one minute exercises of **asking** questions aloud about material she just read.

Ron's jaws reading pictures (Chart 1) and Vanessa's cross-over jaws comprehension picture (Chart 2) oppose the beginning percent accuracies for reading and comprehension recommended by the reading experts in Part II, Table 2. In Ron's four jaws pictures beginning performance accuracies ranged from 1.5 corrects for each error to 5 corrects for each error, 61% to 83% correct. In Vanessa's cross-over jaws picture the beginning performance accuracy was 1 correct and 7 errors, only 13% correct.

Other jaws citations (All, 1977; Neely & Lindsley, 1978a; Sokolove, 1977-1978; J. F. White, 1977) confirm steep correct and error learning.

Learning pictures from pupil performances are products of curriculum and instruction and the strategy behind each (Neely & Lindsley, 1978a, 1978b). A low error strategy yields curricula that produces minimal learning described by "goalie," "railroad," and low-angled TR7 (All, 1977) learning pictures, and shown by most of the average learning pictures of 94 classroom reading books (Neely & Lindsley, 1978b).

Discussion

The reading experts' low-error, high-beginning accuracy strategy has certainly influenced twentieth century reading curricula. Educational experts attended to stimuli logically, rather than to responses, empirically. The responses were measured with ordinal measures only—and then with only "snap-shot" pictures. Required now is a twenty-first century higher-order teaching strategy, curricula, and measurement.

Barbara Bateman (1971) wrote, "We can no longer hide our heads or our inadequate reading instruction in platitudinal sands. Reading failure is a large and regrettable reality" (p. 13). She then cited from the HEW Secretary's National Advisory Committee on Dyslexia and Related Reading Disorders 1969 report that 8 million children in America's elementary and secondary schools that year will not learn to read adequately. Chall (1967) warned, "If schools do not ask for better published programs, and for hard evidence that they are better, they will not get them" (p. 304).

Cross-over jaws and jaws learning pictures show that much greater learning is possible than the 5% to 10% opportunity given by current reading programs. Teachers and other reading experts who measure learning will discover new curricular dimensions and greater teaching. They will also discover what beginning competitive swimmers have known: improving can be joyous, not frustrating.

CALENDAR WEEKS

DAILY BEHAVIOR CHART (DCM-9EN)
 6 CYCLE-140 DAYS (20 WKS)
 BEHAVIOR RESEARCH CO
 KANSAS CITY, KANS. 66103

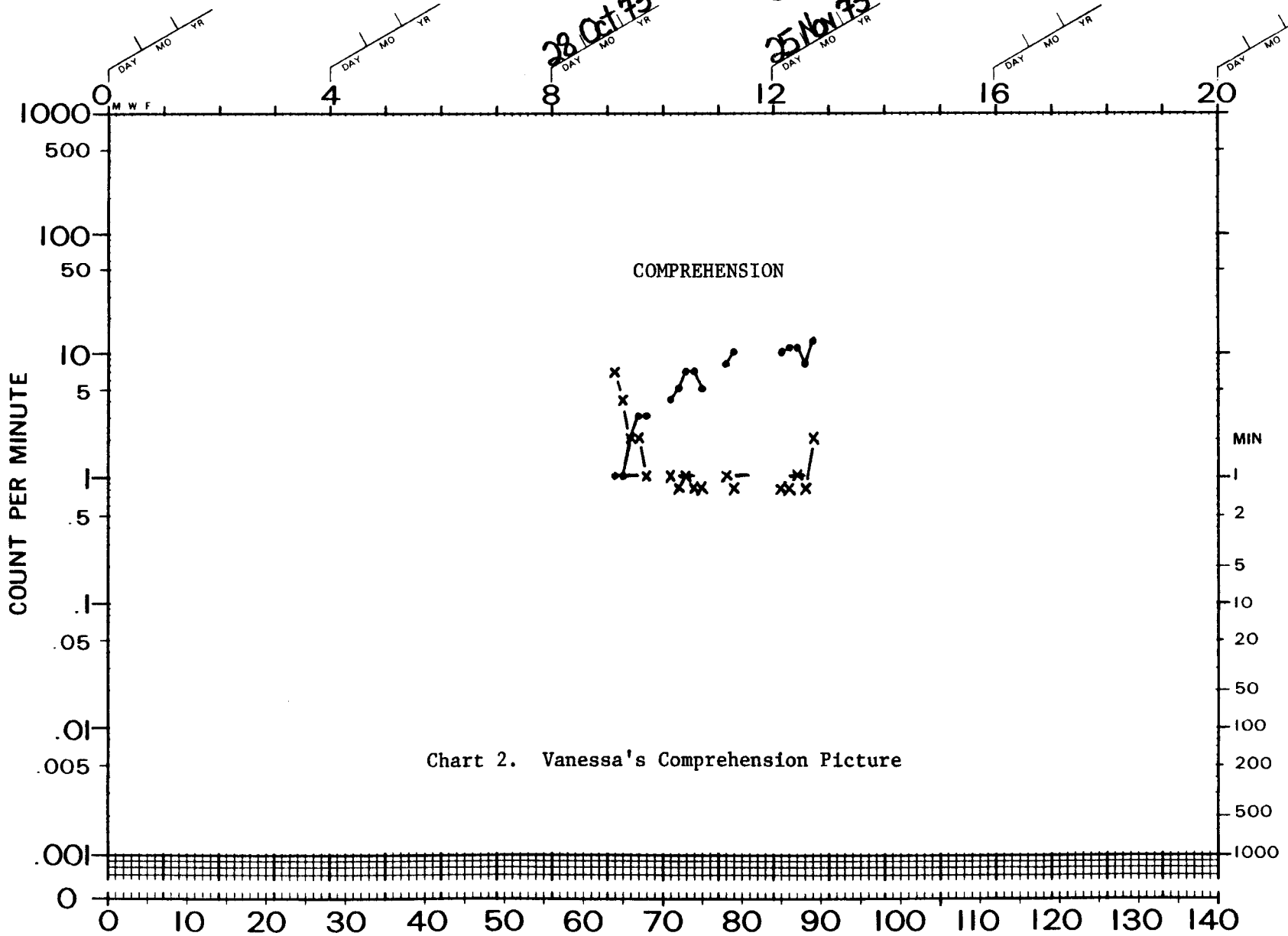


Chart 2. Vanessa's Comprehension Picture

Neely, Malcolm. Seven ways of describing reading-- McGuffey's and six more: parts III and IV. *Journal of Precision Teaching*, Volume III, Number 1, Spring, 1982.

<u>Horensky</u>	<u>Martin</u>	<u>Carkeek</u>	<u>SUCCESSIVE CALENDAR DAYS</u>			<u>Vanessa**</u>	<u>10</u>	<u>Gr. 5</u>	<u>asks questions</u>
SUPERVISOR	ADVISER	MANAGER				BEHAVER	AGE	LABEL	COUNTED
<u>Garfield Elementary School</u>	<u>Everett, Washington</u>								
DEPOSITOR	AGENCY	TIMER	COUNTER	CHARTER	**name changed to protect identity				

Karen Neufeld (1978) discovered better curriculum-pupil matching. After her classroom reading study with 49 pupils she concluded, "The best way to place children in reading materials for best accuracy and speed learning was by comparing charted learning pictures of several performance levels tried minutes apart for ten days. This method was more effective than placement by the instructional level of an informal reading inventory or by student choice" (pp. 49-50).

Gradually, a growing body of educators is using frequency, celeration, and Standard Celeration Charts in education. Many of these Precise Behavioral Management advocates and Precision Teachers are listed, along with their publications in Neely's dissertation (Appendix H, 1978) and by Precision Media (1976).

Precision teachers are being favorably recognized by private evaluators for the Federal Government. The Project IEP report prepared for the Bureau of Education for the Handicapped stated that the language of PL 94-142 fits the basic tenets of Precision Teaching and favorably cited the State of Washington special education programs using Precision Teaching as exemplary (Safer et al., 1978).

In addition, Precision Teachers are being recognized by other educators. Bateman (1971) writes:

One of the real difficulties we face in our efforts to improve reading instruction is having few evaluation systems sensitive enough to provide data for daily instructional decisions . . . Precision Teaching . . . is one evaluation technique which could revolutionize research on the efficacy of group and individual reading instruction. Reading teachers, remedial specialists, curriculum planners and researchers alike can demonstrably improve their teaching and evaluation skills by the use of Precision Teaching. (p 385)

Precision Teaching provides far more than a flick of hope. Precision Teaching learning pictures focus our attention upon curriculum and teaching-learning--for the price of one dot and one "x" on the Standard Celeration Chart each practicing day.

Conclusions

Parts I, II, III and IV of this review warrant the following confusions:

(1) Six traditional ways reading experts describe reading since McGuffey were reviewed and shown wanting as merely ordinal measurement methods;

(2) Poor measurement methods, over-attention to stimuli and pupil performance, lack of standardization, simplification of reading materials, inadequate curriculum-pupil matching process, and the use of low-error, high-accuracy, teaching strategy were cited as reading instruction and curricular problems;

(3) Precision Teaching, the seventh and ratio way to measure reading, was described to point the way to better curricular choices, higher-order teaching strategy, and faster pupil learning (the final teaching product).

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AN ANALYSIS OF INTERVAL SIZE IN A MOMENTARY TIME- SAMPLING PROCEDURE

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In momentary time-sampling an observer glances at the behavior at the end of each of a pre-determined series of intervals. The observer then records whether or not a specific behavior is occurring or a particular posture or "state" is being maintained. Time-sampling is defined by the duration of the measurement session and the frequency of observations. On the Standard Celeration Chart, measurement duration is recorded as the record floor (1/minutes in session) and the frequency of observation determines a record ceiling (number of observations/session length). The graphic distance between the floor and the ceiling, sometimes called the "recording window" (Pennypacker, Koenig, & Lindsley, 1972), reflects the sensitivity or ability of the recording

procedure to measure a range of behavior frequencies. The lower the ceiling, the less likely we are to observe all occurrences of a relatively high-frequency behavior. The higher the floor, the less likely we are to observe very low-frequency behaviors or to account for variability in frequency over the course of increasing durations. In designing time-sampling procedures it is generally best to create as large a recording window as possible, with floor and ceiling values determined by compromises between practical concerns and the need to record actual frequencies of the target behavior.

This paper illustrates the effects on measurement sensitivity of choosing different inter-look intervals (i.e., record ceilings).

Method

Subject and Materials

The subject was a 24 year-old woman working in the Behavior Management Unit of a sheltered workshop. For a total of two hours per day, broken into four half-hour periods, she worked in an individual cubicle packaging sets of ten metal springs in small plastic bags. She received payment each day on the basis of completed work.

Measurement Procedure

Each day the manager or her assistant counted the number of bags completed and computed the count per minute performance for the entire two hours. In addition, the observer conducted a two-minute momentary time-sampling procedure. With the assistance of a tape recorded signal which occurred every two minutes, she marked at the end of each interval whether or not the client was engaged in the task at the moment of observation. This procedure continued for 20 working days without any intervention.

Results

Chart 1 displays production rates which averaged about 13 bags per minute over the 20 day period. The solid celeration line is based on a quarter-intersect calculation (White & Haring, 1980) for the first ten days. It projects as a dotted line into the following ten-day period, bisecting the second half of the data with nearly perfect accuracy. Production was relatively stable, and nearly flat (x1.02 per week) over the entire period.

Chart 2 displays data from the two-minute momentary time-sampling procedure. Again, the celeration of the first ten days is nearly flat