900

TITLE: Practicing Practices

SUB-HEAD: Learning by Activity

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PAGES: 17

TABLES: 5

FIGURES: 10

REFERENCES: 21

SUBMITTED TO: Journal of Precision Teaching
Fall, 1980

Acknowledgements

Thanks to the many managers and behavers who contributed their learning and rate of change data during the exploration of how to improve the effectiveness of our practicing practices. We are pioneers in the realm of fully developing human will, capacity and endurance - three factors necessary to resolving future challenges.

Practicing Practices:
Learning by Activity

by

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Abstract

This paper presents information on our lack of attention to three major performance variables: practice, proficiency and application. Due to our lack of appropriate criteria we are grossly underdeveloping learners' skills, therefore, adversely affecting their knowledge and their applications to various challenges. Four factors related to appropriate practice conditions, specifically: (i) quality, (ii) proficiency goals, (iii) channels and matrixes, and (iv) durations and intervals, are analysed, exploring various practices and some programming implications. The point is made that without appropriate performance criteria we are allowing inadequate levels of performance to pass as acceptable. Learners face unfortunate consequences when they experience difficulties retaining, exhibiting endurance and attempting to apply skills and knowledge they've been evaluated as possessing, yet are well below essential performance levels. The paper points to a resolution of this crisis in learning based on critical quantity and quality criteria along with appropriate amounts of and combinations of practice.

Introduction

Our practical and research attention to improving behavioural management focused on the importance of stimulus and consequence management for the last quarter century (Lindsley 1964, 1972). Thus, we, like much of our society, have overlooked the crucial importance of establishing effective practice conditions to thoroughly develop essential quantities of quality behaviour. For example, during much of our efforts during the programmed instruction phase, a few accurate responses counted as adequate for peformance development. An unspecified amount of "reinforcement" in the form of accuracy feedback was supposed to cement information gains. Later, the field turned its attention toward the benefits of various contingent reinforcing

conditions (Haughton, 1967). During these concentrations of professional perspective reflected in our practical and research efforts, we acknowledged the crucial importance of, yet neglected, intensive practice.

We all know the old saying "Practice makes perfect". Now, with our refined concerns, we might re-write this to an updated "Efficient practice develops proficiency". While previous concerns related to a student becoming "perfect", we now realize that a skillful, competent or proficient person is in better shape than one striving for some absolute notion of perfection. Perhaps we have learned, as did Jonathon Livingstone Seagull, that attaining "perfection" is a process rather than an end? Therefore, we strive to improve our own skills and knowledge or to establish appropriate conditions for others to achieve profiencies.

Appropriate practice conditions include proper stimulus and consequence management, yet, while these are necessary conditions, they aren't sufficient conditions. An enormous amount of appropriate practice, often including thousands of repetitions, is a condition for effective skill development. When conditions of practice, our practising practices, are insufficient the performer fails to reach appropriate levels of performance and may suffer various consequences. While numerous aspects of this complex issue could be explored we will briefly check three significant implications of inadequate practice.

One important consequence of inadequate practice lies in the person's failure to retain adequate quantity and/or quality performance during periods of non-use. Having learned a skill or behaviour pattern, then failing to use it for an extended period, you could be in serious difficulty upon finding yourself needing the performance but discovering you've forgotten how to act. Once skilled in swimming, for example, you would be in serious trouble when boating and discovering that you've forgotten how to swim. This could happen if the skill was inadequately established originally, in part, due to inadequate practice. While there may be fairly rapid relearning, it is inefficient (or even dangerous) to lack a previously held performance.

Secondly, we know there is a relationship between quantity of performance and endurance (Binder, 1980; Higdon, 1980). Higdon's article analyses the beneficial consequences of marathon runners logging over 180 km. per week while training for marathons. Binder analyzed the relationship between levels of performance and capacity to maintain performance over extended periods. In general he found that higher levels of performance sustained performance levels whereas lower performance related to greatly decreasing performance over time. Therefore, we need to ensure that learners experience enough of the right types of practices to meet the dual requirements of sufficient performance levels along with performance durations to ensure useable performance endurance.

The third aspect lacks a thorough data base, so my hope is that further field and theoretical work will continue to explore the relationship between capacity to apply skills and knowledge and several levels of skill acquisition. There appears to be a differential effect when we study the consequences of shifting from a simple task to one that is more complex. Low quantity on the simpler

skill will result in lower performance on more complex tasks (Haughton 1972, Haring and Gentry 1976, Barrett 1979). My "Aims" article illustrated the decrements in more complex tasks caused by two types of inappropriate decision making: (a) too low basic skill performance illustrated by Robert's performance and (b) Mikal and Ronald's data showing some consequences of too low performance aims. The Haring and Gentry data show the differential effects of

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Insert figure 1 about here.

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low basic skills as curriculum demands increase. Barrett's data graphically compares the rates of three groups of people in 16 basic skills. State school students experiencing developmental delay perform somewhat below regular five to seven year olds and adults. The effects of low prerequisite skills are clearly differential, being related to lower complex skill performance. For example, regular adults wrote ones (Think/Write 1's) at a middle frequency of about 210 per minute, writing fours (Think/Write 4's) at about 100 per minute.This divide by 2.1 decrement can be compared to a performance loss of divide by 12 for institutionalized people aged 12 to 54 who performed Think/Write 1's at 60/minute. These three examples illustrate the differential effect of low and correct frequencies on prerequisites. Even greater differences are measurable when comparing performance on more complex tasks.

Insert figure 2 about here.

Hopefully, this brief overview of three issues relating to the importance of adequate practice will serve, allowing us to explore several dimensions of appropriate practice useful in avoiding these unfortunate performance consequences. Perhaps it is unnecessary to point out that there a multitude of factors relating to performance development, so we will examine only a few. Those that will be discussed are: (i) adequate quality, (ii) proficiency goals and practice ranges, (iii) channels and matrixes, and (iv) durations or intervals. These topics cannot be divorced from our traditional topics of effective stimulus and consequence management, so though these won't be specifically discussed, you will understand that we assume effective handling of these programatic features. In this way we can isolate our discussion to the four intriguing topics just mentioned.

1. Adequate Performance Quality

We cannot develop performance without a base of moderate quality. Too much emphasis on quality however, will reduce both the quantity produced and the rate of improvement. Therefore, much care must be exercised so that the learner is not intimidated by over-emphasizing quality criteria.

Although much contemporary evidence exists, I will refer to an old source, an antique penmanship booklet (Bailey, 1910) where it

states:

> "Speed is an important factor in the production of good writing. Slow writing, except when done by an expert script writer, is heavy, wavy, irregular and inaccurate. Fast writing is frequently illegible. Between these two there should, therefore, be a happy medium. That rate of speed which enables one to make two hundred down strokes per minute in a movement exercise is the rate that will produce those light, even, accurate lines that people admire so much in the penmanship of the master artists. All work should be done at the same speed if you expect to become a good penman. Do not have one speed for movement exercises and another for letters and words. When you have cultivated a smooth movement and an even speed your writing will be both pleasing and legible."

Furthermore, coaching instructions in art, dance, acting, music and various athletics encourage the initial development of relatively high frequency acts before requiring refinement of the desired movements. Often these directions include warnings that too much attention to quality, early in performance building or acquisition will inhibit performance development.

2. Proficiency Goals and Practice Ranges

For some time, those of us involved in Precision Teaching and some segments of Applied Behaviour Analysis delighted in producing change as well as improved learning patterns. Our use of frequency or rate as our form of data did not involve searching for relevant criteria levels of performance related to such critical factors as retaining, enduring and applying skills and knowledge. We were, however, by the 1970's (Kunzelmann, 1970; Haughton 1972), collecting some suggestive data indicating that certain levels of performance in one topic related to success in other areas. Certainly the data are not all in; much more work will be done furthering our awareness and our understanding of this complex issue. A growing realization that we are dealing with several inter-related factors such as retention, endurance and application, each implying different levels of competent activity expands our sensitivity to this challenging topic.

We now know that relatively low frequencies support retention of high degrees of accuracy. For example, when we studied the effect of a summer of disuse on the quality of arithmetic performance, we found that computational accuracy stayed high independent of performance frequency. We had anticipated that there would be a differential effect with higher performance losing less than lower performance, but this was not substantiated over July and August, 1976 (Haughton, 1976).

Some of the best published data relating to required performance quantity comes from a landmark article by Wood, Burke, Kunzelmann and Koenig (1978). This article delineates quantity requirements for the application of performance in forty topics in fundamental mathematics skills. In this article they also document performance quantities related to failure in math programs at the grade eight level. Some

examples based on median quantity of digits correct per minute are:

Channel See/Write	Types of Performers: Disabled Students	Unsuccessful Students	Community
Addition			
- adding 1 digit & 1 digit numeral	47/min	76/min	117/min
- add 3/more digit numerals and 2/more digit numerals with regrouping	26/min	38/min	62/min
Subtraction			
- subtract 1 digit numeral from 1 or 2 digit numeral (answer 0 - 9)	33/min	48/min	65/min
- subtracting decimal numerals	12/min	20/min	41/min
Multiplication			
- multiply 1 digit numeral by 1 digit numeral	41/min	82/min	92/min
- multiply 2 or more digit numeral by 2 or more digit numeral with regrouping	4.5/min	9.7/min	21/min
Division			
- divide 1 or 2 digit numeral by 1 digit numeral (answer 0-9, no remainder)	18/min	32/min	46/min
- divide decimal numerals/decimal numerals and write answer as decimal numeral	9/min	20/min	12/min

One aspect evident in these data is that the ratio between disabled and unsuccessful students is similar to that of the relationship between unsuccessful students and the community median. Now we have a

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Insert figure 3 about here.

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dramatic focus on the consequences to students when an educational system fails to set relevant quantity expectations for its clients. To select only one example, the relationship of a basic addition performance is that disabled students are divide by 1.6, while unsuccessful to community is divide by 1.5 creating a gap of divide by 2.5 between disabled and community users of regular mathematics.

We easily understand why those labelled as disabled cannot expect to meet regular performance requirements when their deficiency is, in part, caused by lack of appropriate reference criteria to guide their teachers and their didactic sequences. A quote from a statement of instructional theory illustrates that this lack of criteria begins at an early age:

> "The term kindergarten should be retained, since it describes the function of this introductory period and serves to resist pressure to apply the rigors of schooling too early to young children." (Hall-Dennis Report, 1968)

The importance of practising at different frequencies is often overlooked. Practice can occur below, at, or above competent or fluent performance levels. This deficiency in our planning is easily understood as a side effect of our lack of performance referencing criteria with which to assess or evaluate the adequacy of student activity.

Perhaps the area that is most seriously omitted is that some practice needs to occur at higher frequencies than the desired performance. For example, oral reading reaches competent levels in the 400 to 250 words correct per minute range. North American averages in the first three grades are in the 50 to 70 words per minute range. It is extremely difficult for a student to reach 250 words per minute when they receive direct experience at these low levels along with new selections to read daily. Therefore, we use poetry or short passages of ten to twenty words at first to ensure that the student will achieve over 300 words per minute during the first few weeks of their oral reading experiences. Not only does this experience improve the development of oral reading, but also establishes crucial prerequisite acts necessary for silent reading. Extended exposure to oral selections at inadequate levels in the 50 to 70 words per minute range, fails to prepare a student adequately for either effective oral or silent reading. Furthermore, the student is actually practising the wrong behaviour when not reading orally at or about 250 words per minute or silent reading over 600 words per minute.

Teachers or other people trying to establish effective reading skills cannot be blamed for failing to program students to criteria levels when these aren't specified for teacher guidance and decision making. An authority on reading, Dr. Elizabeth Thorn, suggests four criterion types of silent reading in her book, Strategies for Effective Reading, (Thorn and Fagan, 1975). These are: scanning (very

fast), skimming (fast), recreation (fast and slow), and study (slow). These descriptions are valuable, yet the authors' failure to offer quantitative values as criteria, leaves teachers and students groping for reasonable and effective levels. I suggest certain levels as guidelines in these areas: scanning 20 000 words per minute; skimming 5 000 words per minute; recreation 2 000 to 1 000 words per minute; and study 1 200 to 600 words per minute. Each of these estimated

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Insert figure 4 about here.

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levels of word consumption needs to be paired with an excellent level of comprehension. Comprehension can be checked by the appropriate use of either oral or written answers, each performed at an appropriate level. Some competent level of reading words is crucial to both teacher's and learner's functioning.

To summarize, we need to become aware of and to set competency achievement goals as well as to specify effective practice ranges insuring proficiency development.

One way to offer experiences at high levels is to encourage the learner to recite (Think/Say) sequential materials such as counting or

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Insert figure 5 about here.

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the alphabet. Performance in the 600 to 400 per minute range develops both attention and muscle facility. Although my examples have come largely from reading, similar examples exist in typing, math, writing or musical performance. Following the suggestion by Bob Balabuck about high frequency exercises, Richard McManus practices his saxaphone scales at around 1 000 notes per minute (McManus, 1980). Bob Balabuck, a semi-professional banjo player in Thunder Bay, Ontario, who uses practice ranges in the 2 to 3 000 notes per minute to establish competent levels of performance (Balabuck 1977). Bob uses high paced practice to stengthen the performance of his young student protégés who perform well during musical competitions.

Occasionally you also want to practice well below the competent range. This you do, especially when refining the quality of performance or to master a particularly difficult set of movements. After observing many young people struggling to practice at low frequences the idea of a performance guideline for effective practice evolved. Our best estimate of an independent practice range, at the present time, is to take the low part of a fluency estimate and divide by two. For example, oral reading becomes competent at about 250 words correct per minute. Therefore, an estimate of the level necessary for independent practice is about 125 words per minute. Independent practice levels are important since at these levels learners can evaluate their own performance while quickly reaching competent levels. The guideline of "divide by two" is only a rough approximation, so individual factors need to be taken into account, resulting in higher or lower reference points for an individual's independent practice range.

3. Channels and Matrixing

Recently we began refining our verbs describing student performance. Learning is an active verb. Yet, many traditional educational statements used vague descriptions such as "knows", "understands" and "is able". The move toward stating more clear-cut objectives introduced better verbs such as: calculates, answers, writes, responds, outlines, summarizes or synthesizes. While these output verbs are more adequate, an explicit input/output descriptive system offers clarity along with stimulation to planning (Lindsley 1964, Kunzelman 1970).

Therefore, many educators and psychologists now include channel references such as See/Say to describe more precisely oral reading, or See/Write to define doing math calculations. Basic math problems can also be dictated, so Hear/Write becomes the channel or, if students answer orally, the channel is Hear/Say. Until recently we used lists of the useful channel components to help us, such as this list:

INPUT		OUTPUT	
See	(Se)	Say	(S)
Hear	(H)	Write	(W)
Think	(T)	Think	(T)
Feel	(F)	Point	(P)
Touch	(To)	Mark	(M)
		Do	(D)

While such lists served us well for the past few years, they suffer from several deficiencies. As usual in our contemporary programming, two major sensory inputs, sniff and taste, are lacking. Furthermore, few of us explored all of the combinations (30) implied by even our primitive list, nor is there any systematic order to such an arrangement since our list access is based on a more or less random thought processing. Ordered thinking performance rates are two to three times that of mixed order, so this fact in combination with a realization of potential channel complexities led me to set these topics into a matrix framework in June of 1980.

The first step in arranging the matrix format consisted of ordering the INPUTS. Starting with Feel (for emotions), then Hear, See, Sniff, Taste and Touch we end up with the Think input mode. Ordered from bottom to top, this gives an arrangement of rows that is stable for many of our matrixes whether the matrix refers to mobility, emotions or other forms of expression. For example, we are now using a matrix that covers much of our Academic-Personal-Social development. It looks like this:

INPUTS	Aim (A)	Do (Do)	Draw (D)	Emote (E)	Mark (Mk)	Match (M)	Say (S)	Select (St)	Tap (Tp)	Thought (Tt)	Write (W)
Think (T)											
Touch (To)											
Taste (Ta)											
Sniff (Sn)											
See (Se)											
Hear (H)											
Feel (F)											

OUTPUTS

These eleven outputs are only a sample of the potential outputs that can form the columns of this matrix planning system.

Intersections formed by rows and columns are labelled channel sets. This is a technical term implying a large amount of data as in the cases of See/Say, See/Write, Hear/Write or Think/Say.

This paper will offer only a few of the potentially numerous applications of this conceptual framework. Based on our growing understanding of and awareness about, trans and inter-channel interactions, our capacity to serve learners will receive a great boost as we apply these matrixes to description, programming, summarizing, reporting and analysis.

Three examples of the matrix applied to: (i) an Orff music course offered to Loyalist Early Childhood Education students, (ii) preparation for teaching pre-school students about Community Services, specifically transportion and (iii) information relevant to studying and learning about vegetables are offered. Entries are condensed partly due to the small size of the channel set boxes.

Insert figures 6, 7, 8 about here.

Another matrix that is receiving attention with our recent growing interest in Activity Elements, describes 63 channel sets with the outputs: Wave, Aim, Tap, Squeeze, and Get; along with; Pump, Rub, Shake and Twist (formerly the Big 6 + 6).

INPUTS	Wave (Wa)	Aim (A)	Tap (Tp)	Squeeze (Sq)	Get (G)	Pump (P)	Rub (R)	Shake (Sh)	Twist (Tw)
Think (T)									
Touch (To)									
Taste (Ta)									
Sniff (Sn)									
See (Se)									
Hear (H)									
Feel (F)									

OUTPUTS

The variety of channel sets and even some realization of their implications gives rise to greater awareness of programming requirements. Our data to this date suggest that substantial levels of performance are required, especially in the Think/ and Feel/ rows, making 18 channel sets of the possible total of 63. Using this matrix descriptively, you will be surprised at how few channel sets we generally employ in our programming.

This lack of comprehensive use of, and instruction in, appropriate amounts of channel sets can be illustrated by referring back to the math comparison data. The examples I selected were all See/Write, as were all of the 40 topics checked. Thus, descriptively, this study explored 40 different math topics all in the See/Write channel set or 77/1, where 77 is the total possible and one is the number of channel sets measured, recorded, compared and analysed. In another instance, I summarized our efforts with a young exceptional student and suprised myself by "discovering" that of approximately 80 charted projects we

indulged in mainly four channel sets: See/Say, See/Write, Think/Say and Think/Write. We gave no specialized attention to the Feel/ row and only quite mechanical coverage to Think/ row.

Since mobility is a crucial topic we'll touch briefly on this matrix. The rows are the familiar Feel/, Hear/, See/, Sniff/, Taste/, Touch/, and Think/ while the columns are /Roll, /Creep, /Crawl, /Scoot, /Cruise, /Walk, /Run; /Gallop, /Hop, /Jump, /Leap, /Slip, /Slide:

INPUTS	Roll	Creep	Crawl	Scoot	Cruise	Walk	Run	Gallop	Hop	Jump	Leap	Slip	Slide
T/													
To/													
Ta/													
Sn/													
Se/													
H/													
F/													

OUTPUTS

This gives us a matrix of 91 channel sets, not all of which have the same significance or programming importance, but which can be important as well as useful during instructional programs designed to develop basic mobility and walking.

Insert figure 9 about here.

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4. Durations and Intervals - Sprints

In the late 1960's when we began our serious attempt to record both count and time, to explore such data's efficiency and usefulness, we tended to record performance to its completion, the end of a sheet or other arbitrary assignment length. This caused computational difficulties in determining the rates and also set rather lengthy performance intervals for students. Harold Kunzelmann and myself began exploring stable one and two minute intervals as a starting base for students, teachers and our information base. Since students seemed more comfortable and data were much easier to compute (many people find simple division difficult) we shifted much of our attention to relatively short intervals.

One minute is not a short interval if you are unskilled! I remember dropping to a .5 minute interval instead of the whole minute with a low performing student in Eugene, Oregon to see if this interval would accelerate performance development. The student's half minute rate doubled the full minute's performance. So, this meant that the student emitted his full performance in the first half minute, fatiguing or burning out in the last 30 seconds. During skill building we've found that short intervals are related to higher performance levels while also reducing the amount of duration induced factors (attention and motivation, less fatigue for example). We now set up "sprint" practices where a series of short intervals give the learner the experience of high quantity in brief periods.

You could check various intervals in the same way you would check stimuli, consequences, channels or intervals, by snapshots or 10DAY

Classroom Learning Screening a process developed by Og Lindsley and carried on by International Management Systems (Kunzelmann and Koenig 1979). Determining the learner's maximum interval that ensures learning is a cornerstone in an effective program.

Compounding

Combinations of skill building factors will help people to develop high performance levels in brief developmental periods. Perhaps it is self evident that effective practice conditions may combine several practice considerations. Common combinations are the sprint interval, strong channels, related to aims based on our best estimate of proficient performance.

One of the most effective applications of these contemporary quantity and quality considerations occurs in locating and establishing prerequisite skill performances. It seems cruelly ironic that our failure to specify frequency based performance criteria causes student failure to reach necessary levels. Not only is there a lack of criteria but teachers are even encouraged not to quantify information about performance. Quoting again from the Hall-Dennis report (1968), Elementary School teachers are instructed: "The teacher will be concerned with qualitative aspects of achievement - "Does Jan like to read?" "Can Susan describe her house?" rather than with quantitative measurement. (emphasis added - EH). In Ontario, Canada one consequence of such philosphy: shifted teachers from poor achievement testing to no quantitative analysis at all.

Although there are many possible examples, perhaps relating to basic math skills will suffice. By about 1971 we realized that basic math facts in addition, subtraction, multiplication and division is needed at 120 to 80 correct per minute in the See/Write channel whereas performance actually checked out at 25 to 30 problems correct per minute. Many students and teachers reported difficulties in reaching these new levels. We quickly realized that performance on See/Write sums to 18 rested on a set of prerequisites, that all had to be at, or close to, competent/proficient levels to synthesize constructively into the See/Write +18 assignment. We checked some correlations finding high, statistically significant relationships between the target task (eg. See/Write +18) and prerequisite such as Think/Write digits 0-9 (Haughton, 1972). I recently checked the performance of Loyalist College students on See/Write mixed math facts correlated to Think/Write 0-9. The middle correct on computations falls at 45 per minute while sequential number writing is at 130 per minute.

Insert figure 10 about here.

We are no longer surprised to find educational settings that are unaware of quantity criteria fail to produce appropriate levels in such crucial topics as: Think/Say counting forwards and backwards, See/Say reading numerals, sequenced and mixed order, Think/Write numbers, See/Say operational signs, Think/Say from a number to a

number along with adequate coverage of Think/Say or /Write and Feel/Say or Write my personal reasons for becoming skilled in math. I won't go into specifying criteria levels for these topics, but you will not be surprised to find extremely low and non-applicable performance levels in these topics since no effort had been made toward establishing high, proficient levels of performance.

Our lack of specific performance aims, goals or standards are creating a contintental crisis in education. It is also partly due to this lack that we fail to practice adequately. When performers know what criteria they are up against, as in track or swimming, they generate extremely high practice ratios to ensure adequate performance levels.

While many professionals have ignored the importance of goals or aims I will never forget the insightful reaction of a second grader. While exploring the importance of aims, I asked the class why we needed goals or aims. One second grader popped up with, "Well, if you don't have aims, then you'd be AIMLESS"! While we haven't exactly been aimless, desiring as we do to produce performance improvement, our lack of precise aims has led to conduct inadequate practicing practices. Out of the mouths of babes.

Combining the will of our students to improve, with our excellent stimulus and consequence management, while augmented by our growing information about proficiency levels and practice conditions, we will greatly increase our students' performance and problem solving capacities. Thoroughly developing our students' skills will greatly enhance their capacity to cope with problem resolution and decision making challenges they will face in the future.

LEGENDS

FIG. 1 Note the greater loss of performance in more complex tasks when a disabled student is compared to more able peers.

FIG. 2 Comparing Think/Write 1's with Think/Write 4's illustrates the differential effect of low tool skills. Similar examples occur in counting and counting tiles.

FIG. 3 Math comparison data illustrates some of the consequences of low prerequisite skills.

FIG. 4 College students who read their texts more rapidly also write more details during comprehension checks. In this case neither the silent reading (channel: See/Thought text) nor the comprehension check (Think/Write details) is at competent levels, minimum estimated as 600 words/minute and 40 details/minute, respectively.

FIG. 5 A sample of 10 pinpoints from the 271 Pinpoint booklet (HAUGHTON 1977). Note that young people perform at or about adult levels correctly on these topics. These data are from snapshots, therefore, are quite low estimates at the levels achievable with a bit of correct practice.

FIG. 6 An example of a matrix describing portions of an Orf Music program being presented to Early Childhood Education (ECE) students. There are 37 channel sets entered describing various assets. Entries are related to total possible by 77/37. Two rows, Sniff and Taste, are not used in this example, while there are entries in all columns.

FIG. 7 Matrix describing the teaching theme on transportation design for the Marmora Street Preschool of 3 to 5 year olds. The matrix stimulates thorough coverage of both inputs and outputs. We strive for high levels of quantity and quality performance in the areas chosen as high priority.

FIG. 8 This matrix describes various considerations in teaching children about vegetables and their nutritional value. When matrixes have over ten entries, priorities must be met. High priority channel sets receive instruction, practice and measurement. Lower priority channel sets expand the student's awareness of the topic.

FIG. 9 A sample page from the Body Control Guidelines booklet (KOVACS AND HAUGHTON 1978). The levels indicated by a range bar I were collected by Mary Kovacs and her staff. While these ranges have proved to be lower than competent levels, they formed the basis of our early decision-making when programming for severely disabled students.

FIG. 10 College students perform writing digits 0-9 (Think/Write) at too low a level to correctly signify their skills in basic math computations on a sheet with mixed addition, subtraction, multiplication and division (See/Write). The correlation of .65 reinforces the point that more adequate Think/Write 0-9 (at 250 - 150 legible digits/minute) would facilitate these student's math capacities.

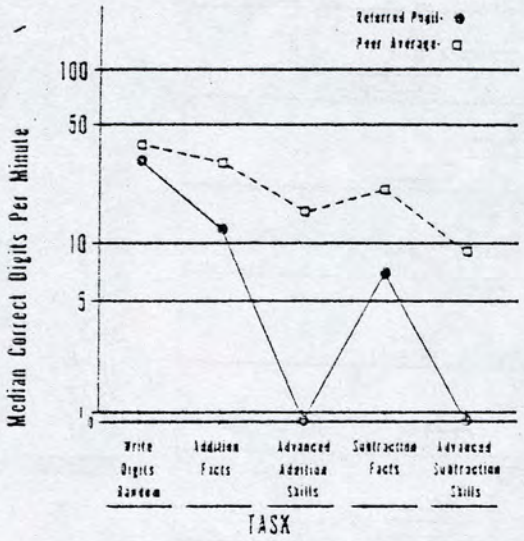


Figure 3-5 Median correct digits per minute for referred pupils and two peers on selected arithmetic tasks.

the pupil for one minute, then says, "Thank you," and proceeds to the next probe. The timing is made as unobtrusive as possible. The standard length of timing is to obtain uniform performance conditions, not to exert pressure on the pupil.

The probes are given for five consecutive days to help ensure that reliable data are obtained and to observe performance trends. Children who improve appreciably during the five-day period are likely to require different programming than children whose performance remains stable or deteriorates.

If probes are to be used for precise assessment or for daily monitoring of pupil performance, they must be constructed on tasks which are more finely sequenced than the intake sequence described above. Suppose on the sequence of intake tasks it was found that a pupil was proficient at saying numbers, writing digits, and performing addition facts, but could not perform advanced addition tasks. A sequence of advanced addition skills could be constructed and the pupil's performance probed on each skill until the exact skill requiring instruction is found. Thereafter, the appropriate probe would be presented daily to evaluate the pupil's progress on that task.

The use of probing procedures and the obtained data can be shown by considering representative data for Bert, a pupil referred to the EEU, and comparable data on his peers (see Figure 3-5). Bert's correct scores for selected arithmetic tasks are shown by dots (.) and the average correct scores for his peers is shown with boxes (□). Bert approximates his peers' performance on writing digits in a random sequence; however, his score on addition and subtraction facts is about one-third that of his peers. On advanced addition and subtraction tasks Bert scored zero, compared to 15 and 9 correct digits per minute on addition and subtraction tasks for his peers.

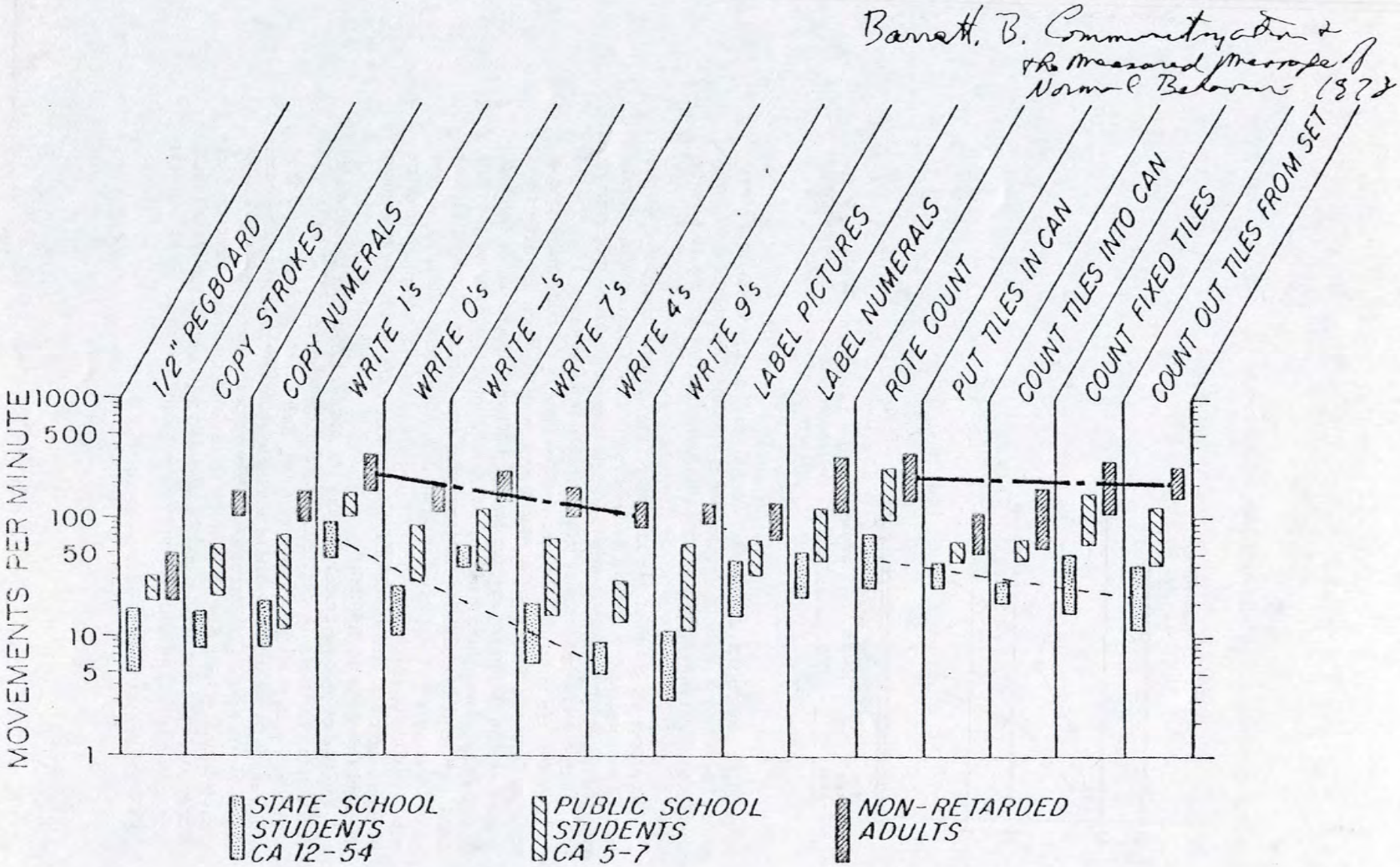
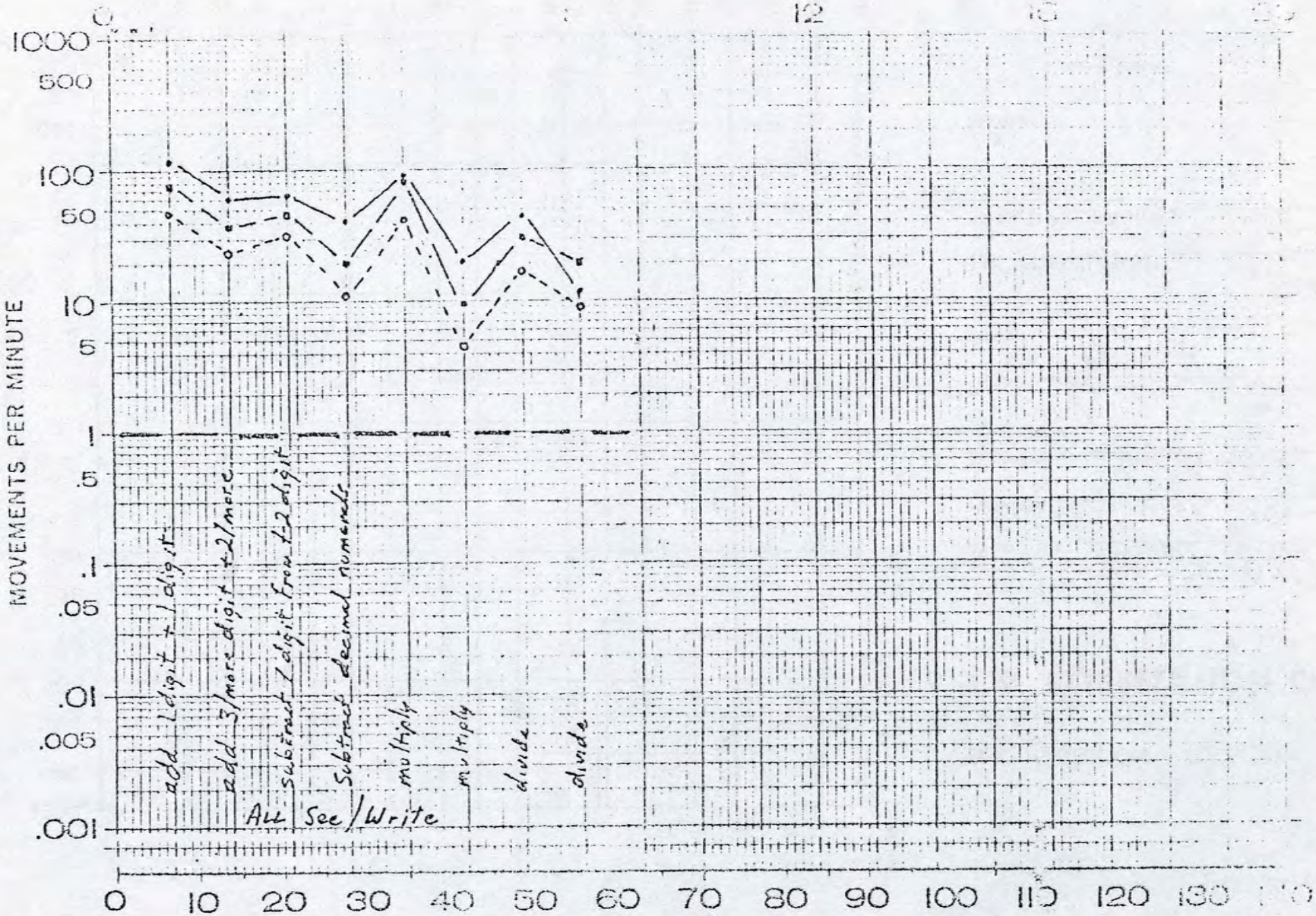


Figure 1. Frequency comparisons on some components and prerequisites of elementary skills. (Based on an unpublished pilot study conducted by Frances George and Deborah Pease)



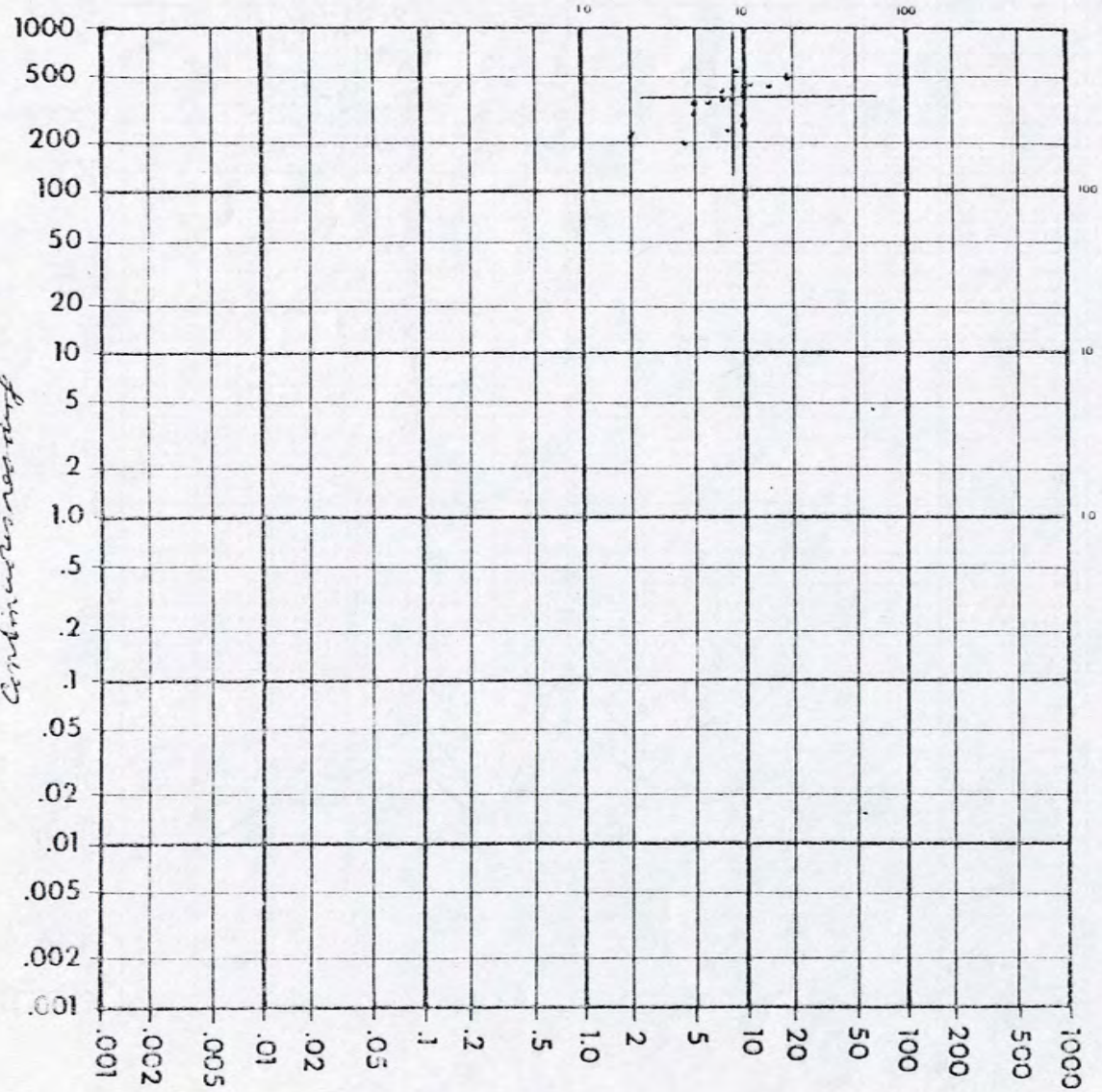
SUPERVISOR ADVISER MANAGER

DEPOSITOR AGENCY

BEHAVER AGE

CHARTER

80 10 06



ERIC HAUGHTON - MAY, '77

6 X 6 CORRELATION CHART

6 x 6 CR-3

Manager ECE I students

Adviser Eric Haughton

Supervisor Ray Michal

Grade Logolist 1st year

Count 18
and if 10 day screening

PHI CORRELATION .65

EXACT PROBABILITY 1.0×10^{-2} (.01)
(Fisher)

Matrix:

1	6
8	2

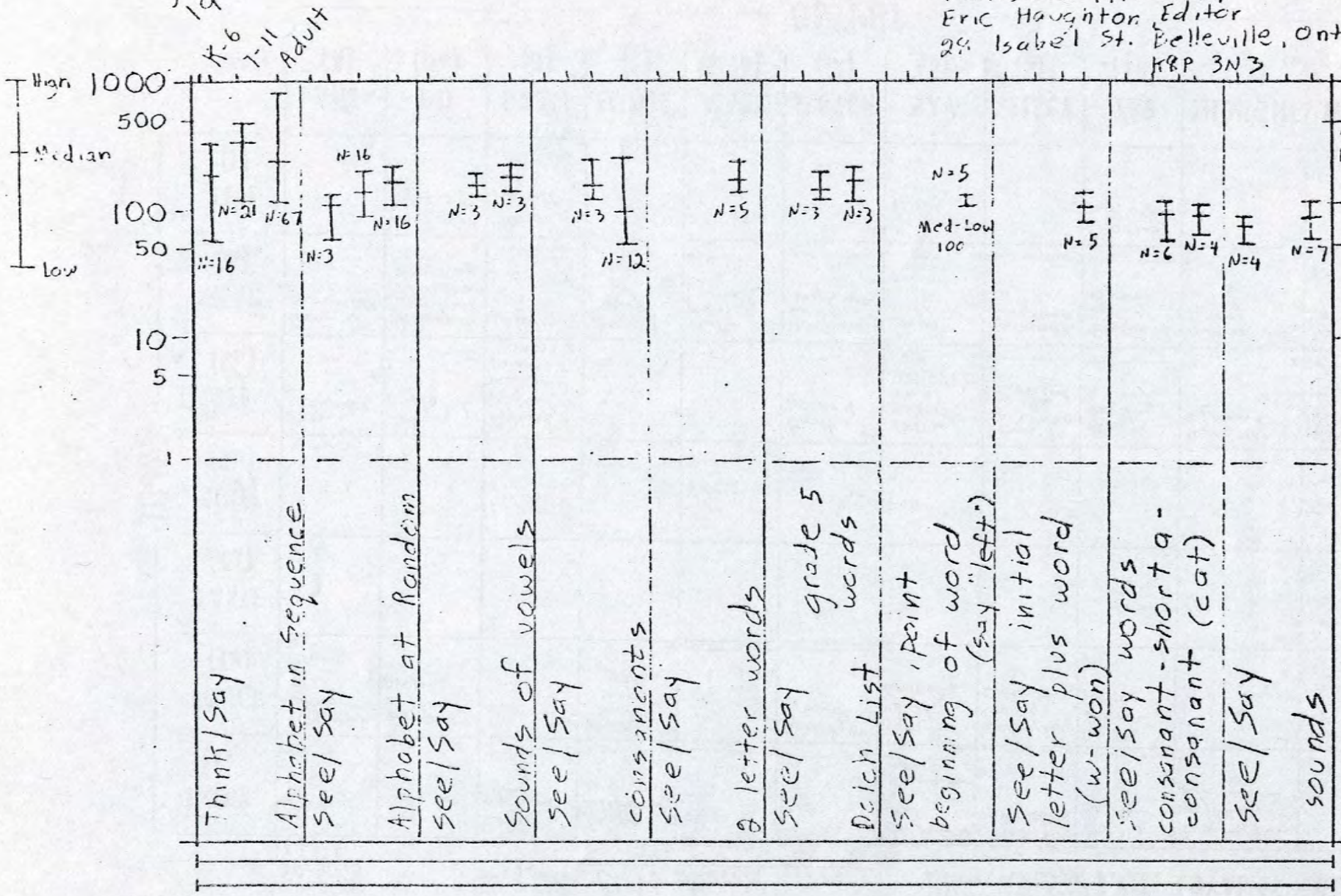
Charter EH 80 10 07

Calculator EH

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

Published - 1977 11 09
Eric Haughton, Editor
28 Isabel St. Belleville, Ont
K8P 3N3

Summer 1977-76



RSS-1

Revision Da
1978 06 3

10/70

271

K + B BROWN
E + E HAUGHTON
R MENNINGA
THUNDER BAY

(K-6)(7-11)(Adult)

L.C
77 11 08

SNAPSHOT
SUMMARY
* READING

Dr. Eric C. Haughton
LOYALIST TEACHING MASTER

PERFORMANCE MATRIX
ACADEMIC PERSONAL SOCIAL
80 09 04 HPM-061

Concepts: movement, beat, rhythm, songs, actions, feelings, expression

80/10/15 (Y | M | D)

Topic Orff Music

E.C.E. LOYALIST COLLEGE

77/37

INPUT	AIM (A)	DO (Do)	DRAW (D)	EMOTE (E)	MARK (Mk)	MATCH (M)	SAY (S)	SELECT (St)	TAP (Tp)	THOUGHT (Tt)	WRITE (W)
THINK (T)			Represent action, idea	Sense ideas and feelings			Songs, actions, ideas, exercises, Thoughts and emotions	Best song and action	Beat or Rhythm	Imagine, plan sequence, or expression	
TOUCH (To)	Self, other person.	Pass pattern on to next person.		Touch, gentle, hard, soft, slow, quick		Same type of touch	Type of touch, contact	Preferred type of contact	Imitate taps or patch		
TASTE (Ta)											
SNIFF (Sn)											
SEE (Se)	Action, instrument	Action, clap/patch	Actions, people in movement, Notation ΙΠΙΠΙΖ			Rhythmic patterns	Action, patterns, Songs ΙΠΙΙΠΠΖ etc.	Favourite song, action, Smoothe movement	Beat or Rhythm	Impression of movement	Notation ΙΠΙΠΖ
HEAR (H)	Game of "hot and cold"	Actions in Songs - reels, Square dances, directions	Imagery	Various feelings	Rhythm patterns,	Immitate or echo Songs, taps	Songs	Favourite song, tune	Clap/Patch to beat, rhythm	Imagine ideas in song	Trace or copy song
FEEL (F)		walk, run, hop, jump skip	Actions of feelings				Songs about feeling		Clap hands self, others		

OUTPUT

P Michol — Supervisor
Eric Haughton — Adviser
Katherine Smithrii — Manager
ECE I-II STUDENTS — Behaver
17-30 — Age
Reg. Students — Label

Dr. Eric C. Haughton
LOLALIST TEACHING MASTER

PERFORMANCE MATRIX
ACADEMIC-PERSONAL-SOCIAL
80 09 04 (HPM-06)

Concepts: types, safety, seasonal ecology, conserving, occupations

80/11/12
Y | M | D

Topic Transportation

E.C.E. LOYALIST COLLEGE

77/50

INPUT	AIM (A)	DO (Do)	DRAW (D)	EMOTE (E)	MARK (Mk)	MATCH (M)	SAY (S)	SELECT (St)	TAP (Tp)	THOUGHT (Tt)	WRITE (W)
THINK (T)	Different types of transport	Act or mine transport	Different types of transport	Favourite transport			- How travel to school - Safety rules - Traffic signals			- Safety rules - Conserving and consuming	
TOUCH (To)	Toy vehicles		Vehicles, parts	Likes and dislikes of textures, surfaces.	Symbol for door, light, window etc		- Occupations - Likes and dislikes.	Favourite transportation			
TASTE (Ta)			- meals used on planes, boats - Snacks				Foods used in transportation				
SNIFF (Sn)	Fumes - exhaust - gasoline	Mine fumes	Sources of fumes and exhaust	Feelings about pollution	Instance and non-instance of odours, fumes	Oil fumes to oil - gasoline - exhaust	Names of odours, fumes				
SEE (Se)	Vehicle and roadway	- Stop and go - red, green - Occupations - Safety rules	- Vehicle and roadway - people using transportation - People conserving	Rules of safety Likes and dislikes of conserving - consuming	Kinds of transportation	- Vehicles - Traffic signals	- Vehicles, - Safety - Occupations	Vehicle and roadway Best form of transport	Seasons and vehicle	Occupations	Trace or write - car - truck - plane - boat etc
HEAR (H)	Conserving or consuming transport.	Act like vehicle - canoe - car - truck - jet	Vehicles, Conservation people using different types	Likes and Dislikes.	Vehicles, Conserve, Consume	Types of transport	Sounds, Safety rules	Fast, Slow, Conserve, Consume	Vehicles	Imagine old and new ways of travel	Trace or copy - car - truck - boat
FEEL (F)	Occupation	Role play	Types of transport. - consume - conserve	What like to be -	Occupation on ditto		- Likes and Dislikes, - Safety	Seasonal vehicles - Safety			

OUTPUT

Liz Vandersel — Supervisor
Eric Haughton — Adviser
ECE I + II Students — Manager
Preschool Students — Behaver
3-5 years — Age
Reg. Preschool — Label

Dr. Eric C. Haughton
LOYALIST TEACHING MASTER

PERFORMANCE MATRIX
ACADEMIC PERSONAL SOCIAL
80 09 04 (HPM-06)

Concepts: nutrition, shapes, colours, origins, composition, preparation, immature-mature; harvest, preparation, taste ...

80/10/03 (Y | M | D)

Topic Vegetables:

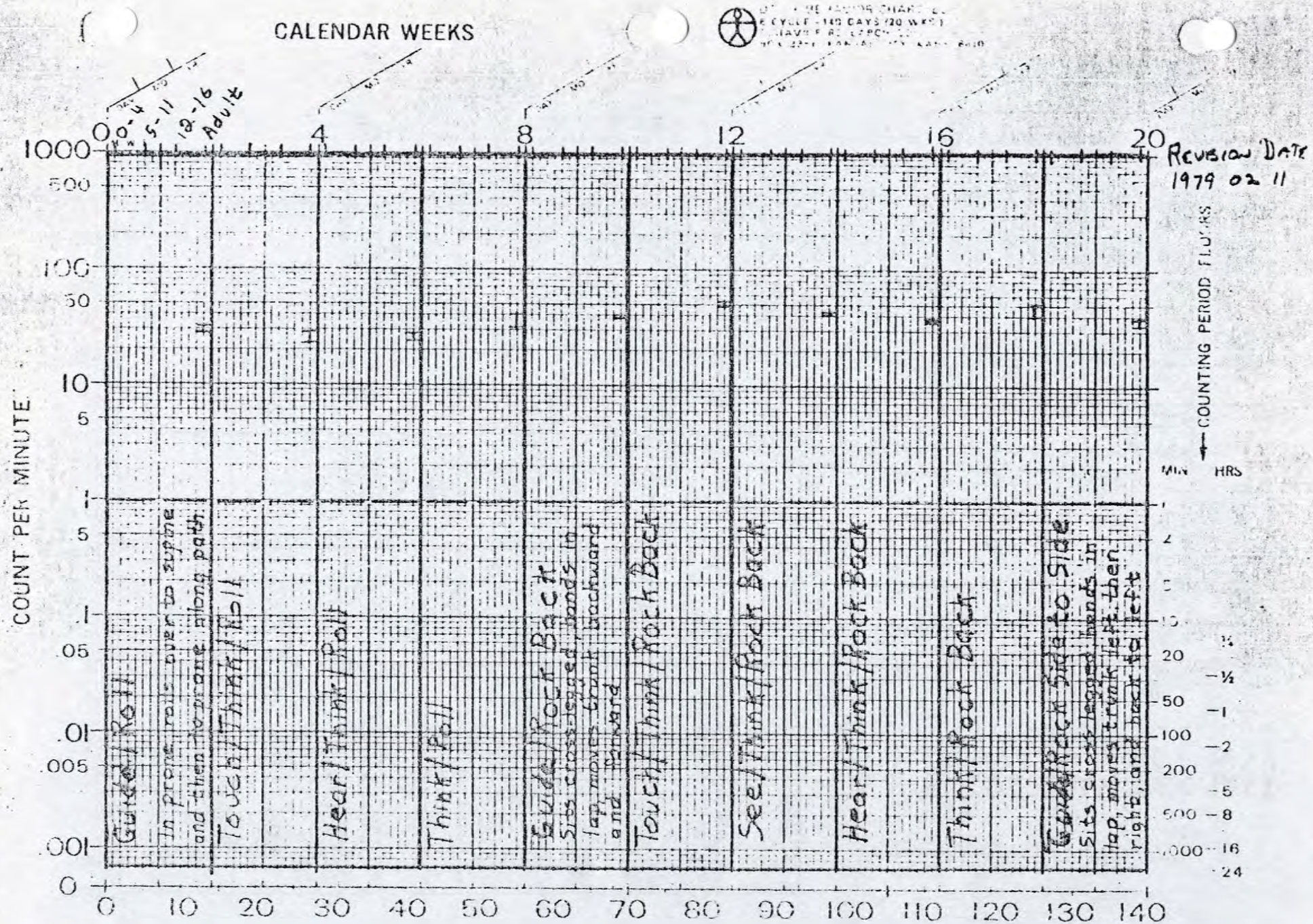
E.C.E. LOYALIST COLLEGE 77/60

INPUT

	AIM (A)	DO (Do)	DRAW (D)	EMOTE (E)	MARK (Mk)	MATCH (M)	SAY (S)	SELECT (St)	TAP (Tp)	THOUGHT (Tt)	WRITE (W)
THINK (T)		Pretend to be a vegetable - mime	Favourite vegetable	Likes and Dislikes of Vegetables - Preparation - raw/cooked	Favourite foods	Vegetable to pix	Shapes, Colours, nutrition, textures.	Likes and Dislikes; Textures, Colours		Imagine colours, shapes, textures	
TOUCH (To)	Texture, likes and dislikes		Art - texture	Likes and Dislikes	Textures	Textures - smooth - soft - crunchy	Names of Vegetables	Mature-immature - Smooth or rough			
TASTE (Ta)	Likes and Dislikes - cooked - raw		Vegetables	Likes and Dislikes	Flavours	Cooked or raw	Favourite dish - name of Vegetable - raw or cooked	Likes or Dislikes in taste.		How to improve taste - spices etc.	Trace or copy - sweet - sour - spicy
SNIFF (Sn)	Correct vegetable		Vegetables	Likes and Dislikes	Pictures of Vegetables	Sample to whole	Names of odours - Likes and Dislikes.	Favourite odour	Vegetable		
SEE (Se)		Pretend to be vegetable - mime, draw	Shapes, colours, Country or garden scene	Likes and Dislikes	Shapes, colours, plant and crop	Mature or Immature Vegetables	Names, colours, Shapes.	Food preferences. Snack food	Shapes, textures	Plan menu for Snack time	Trace or copy names
HEAR (H)	Specific Vegetable	Act like Vegetable.	Specified Vegetable		Nutritious Vegetables.	Colour, Shape, Size	Names, Vitamines	Nutritious Vitamines Roughage	Vegetable	Imagine food for meal.	Names
FEEL (F)		Pretend to feel like a Vegetable - Happy - Sad	Emotions	Likes and Dislikes	Preferences		Emotional description	Favourite food		Imagine emotions at celebrations ☺ ☹ 😮 ⊗	Trace or copy emotion words.

OUTPUT

Liz Woerscl — Supervisor
Eric Haughton — Adviser
ECE I-II Students — Manager
Preschool Students — Behaver
3-5 years — Age
P. Preschool. — Label



REVISION DATE 1979 02 11

M. Kovacs
E. HAUGHTON TEACHERS
SUPERVISOR ADVISER MANAGER

(0-4)(5-11)(12-16)(Adult) TRUNK CONTROL
BEHAVER AGE LABEL COUNTED

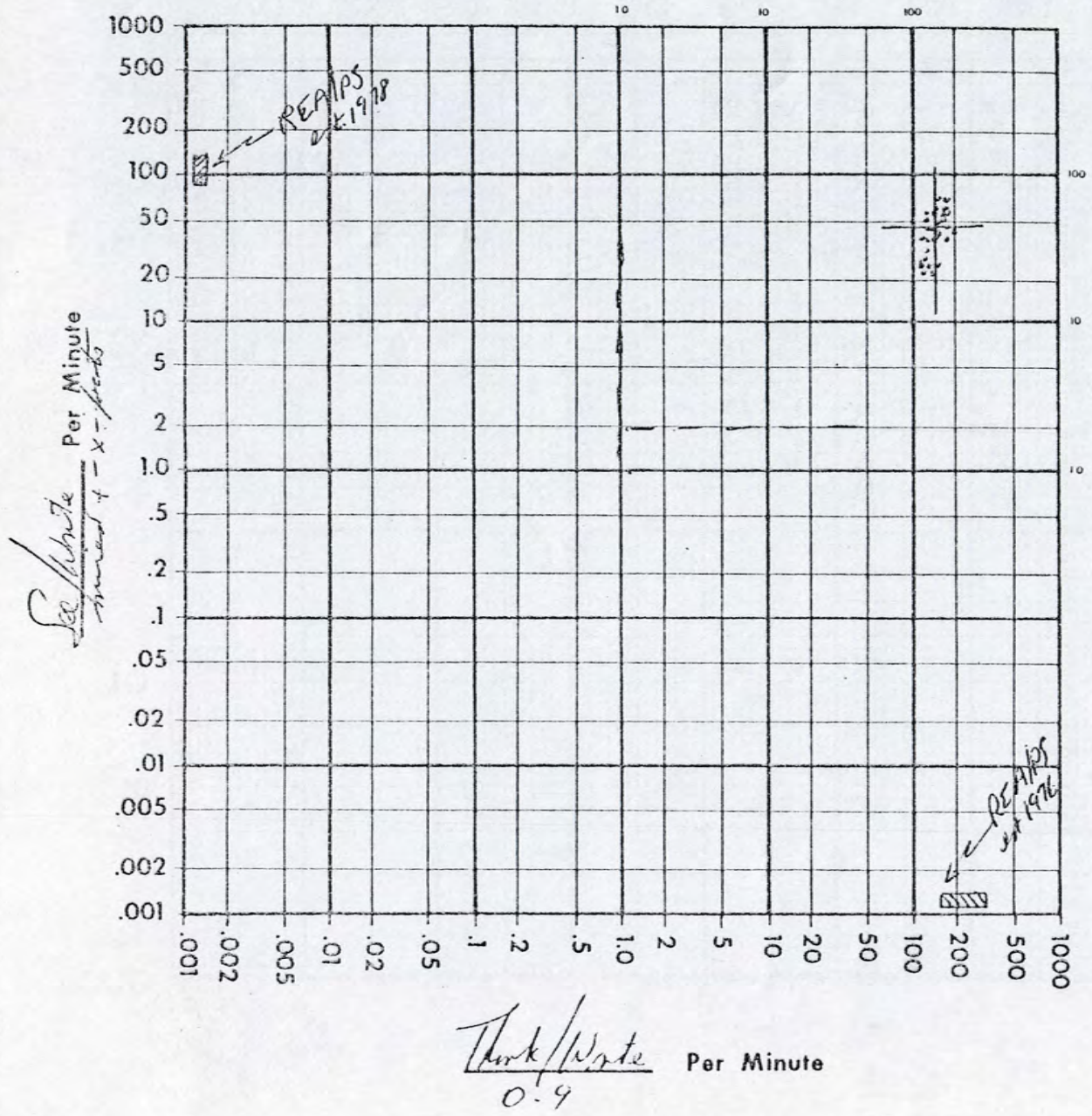
L. GUTZIET
DEPOSITOR TIMER COUNTER CHARTER

1980 09 30

ERIC HAUGHTON - MAY, '77

6 X 6 CORRELATION CHART

6 x 6 CR-3



Manager ΣCE I students

Adviser Eric Haughton

Supervisor Ray Michol

Grade Loyalist 1st year

Count 26 (3 lost)
mathsnapshot

PHI CORRELATION .56

EXACT PROBABILITY 1.0×10^{-2} (.01)
(Fisher)

Matrix:

2	8
10	3

Charter ΣH. 80 10 02

Calculator ΣH

References

Bailey, J. J., The Bailey Method of Penmanship; Sir Isaac Pitman Ltd. (Canada), Toronto 1910 (not specified publication).

Balabuck, R., Developing Competent Banjo Playing - High Paced Practice. Presentation at Lakehead University, Thunder Bay, Ontario, 1977, July.

Barret, B., Communitization and the measured message of normal behaviour, in York, R. and Edgar, E. Teaching The Severely Handicapped. vol. 4, Special Press, Columbia, Ohio, 1979.

Binder, C., The Effects of Explicit Timing Procedures and Performance Duration on Elementary School Academic Performance. Unpublished manuscript, 1980.

Duval, B., A Modern Day Fable: Prince Og and Princess Log. Exceptional Teacher, 1980, April, p. 5-6.

Hall-Dennis Report, Living and Learning. Ontario Ministry of Education, Queen's Park, Toronto, Ontario, 1968.

Haring, N. and Schiefelbusch, R. Teaching Special Children. McGraw-Hill. New York, 1976.

Haughton, E. C., A Practical Way of Individually Tailoring Classroom Consequences, Dissertation, Xerox Corp., 1967.

Haughton, E. C., Aims, Growing and Sharing, in Jordan, J. & Robbins, L., Let's Try Doing Something Else Kind of Thing, CEC, Reston VA 1972, 20-39

Haughton, E. C., Unpublished Hastings County Math Data, Belleville, Ontario, 1976.

Haughton, E. C., (compiler), 271 Pinpoints; crossage performance ranges - Kovacs and Associates, 72 Main St. W., Grimsby, Ontario, 1977.

Higdon, H., The truth about high mileage, The Runner. 1980, 2, #11, p. 61-65.

Koenig, C. and Kunzelmann, H. P., REFER, a rapid examination for early referral, Merrill Publishing Co., Toronto, 1979.

Kovacs, M. and Haughton, E., Body Control Guidelines. Kovacs and Associates, 72 Main St. W., Grimsby, Ontario, 1978.

Kunzelmann, H. P., Precision Teaching. Special Child Publications, Seattle, WA. 1970.

Kunzelmann, H.P. and Koenig, C., Classroom Learning Screening, Merrill Publishing Co, Toronto, 1979.

Lindsley, O.R., Direct Measurement and Prosthesis of Retarded Behaviour, Journal of Education, 1964, 147, 62-81.

Lindsley, O.R. From Skinner to Precision Teaching: The Child Knows Best in Jordan, J. and Robbins, L. (eds), Let's Try Doing Something Else Kind of Thing, CEC, Reston, Va. 1972.

McManus, R. Developing saxaphone skills. Data Sharing Newsletter. 1980, April.

Thorn, E. and Fagan, T. Strategies for Effective Reading, Gage Educational Pub., Toronto, 1975.

Wood, S., Burke, L., Kunzelmann, H. P., and Koenig, C., Functional criteria in basic math skill proficiency. Journal of Special Education Technology, 1978, vol 2, 29-36.