each error, and Abdul was asked to "Start again." Corrects and errors were counted during 1-minute timings.

Abdul told us the following (see Charts 1 and 2):

1. I can't identify pictures fluently or accurately. Performance standards are 25-31 corrects/minute. My pace was 5-9 corrects/minute and 1-5 errors/minute. My errors were accelerating more than my corrects.

2. I can adequately manipulate a paddle switch. My pace (48-142/minute) is well below performance standards (about 220-400/minute), but it's improving (x1.4), and it's more fluent than performance standards on other composite skills.

3. I prefer the Manual Scan Mode (72-120/minute) to the Auto Scan Mode (2-6 corrects/minute, 9-52 errors/minute, and errors accelerating at x2.3).

4. I can visually track the indicator light (7-18/minute), although well below performance standards (38-42/minute).

5. I quickly learn that a picture and the indicator light go together. My pace is 2-14 corrects/minute and 1-11 errors/minute, but corrects are accelerating at x5.3 and errors are decelerating at /7.3.

6. I don't stop pressing the switch when the appropriate indicator light is illuminated. I don't understand the functional relationship between the switch, light, and the picture. Although I can operate isolated portions of the communication system, I have difficulty putting all the parts together.

When presented with the information from the assessment in a plain english, straightforward manner, Abdul's parents agreed with us that purchase of the electronic communication system at this time would be, at best, premature. Abdul's educational plan was designed to increase his pace on accurate identification of Rebus pictures and in the component skills of using the Zygo system, such as see/touch light and see picture/touch light. However, given Abdul's performance and celerations on this assessment, the priority for a system at this time would be a direct selection picture board.

The assessment was an effective tool in several ways. It allowed Abdul to tell us his ability on related component skills required to operate a communicative system. It clearly identified deficits and their magnitude, and suggested goals to be addressed in his educational plan. It facilitated discussion of an appropriate communication system for Abdul between his parents and teacher. It saved a large sum of money. It prevented a sophisticated "magic key" that didn't quite "fit" from being discarded into a dusty closet.

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[The following is Part I of an article written by Owen R. White, in which he uses a special, analogizing format. The remaining parts of this article will appear in subsequent issues.]

AIM*STAR WARS

[Setting AIMS that COMPETE]

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Episode I: The Deathstar

Once, a long, long time ago, on a charted performance record far, far from aim, the Learner Rebels were struggling to overthrow the bonds of

> the evil Normie Empire. Meanwhile, on the desert planet of Kanada, far below the conflict which raged above him among the Uni-versa-tay battle cruisers, young Eric dreamed of leaving Uncle Owen's organic behavior farm and becoming a star-fighter for the Learner Rebels.* "Performance Standards! Who needs them?", he shouted (Haughton, 1982).

It will take Uncle Owen a long time to understand. Perhaps, though, there is still time before the storm troopers overrun his small, isolated, not very special homogenized behavior dairy. Just perhaps. This is the story of Uncle Owen's struggle.

Two years before young Eric hurled his angry challenge at the stars he was carefully considering what he had learned about performance aims (Haughton, 1980). He wrote of the basic reasons for establishing aims, reviewed more than a little of the history behind attempts to find meaningful performance aims, and charted a path for future growth. Basically, he identified four possible advantages for establishing high standards: (1) improved skill retention over periods of disuse, (2) greater endurance over periods of intense skill use, (3) improved rates of learning with related but more complex tasks, and (4) improved performance quality. With the possible exception of performance quality, Eric contended that a skill would generally prove more useful as higher frequencies were achieved. He believed that quality was also likely to improve (e.g., handwriting becomes more legible) as frequencies accelerated, but only up to a certain frequency. Above that point, quality might suffer. Even when seeking greater quality, however, superfluency might still be beneficial. After all, slowing down is always easier than speeding up to meet situational demands.

Fundamental to Eric's arguments, and the arguments of others, is the basic premise that a skill should be **useful**! It should not be lost once instruction is terminated, nor should it be so effortful that it cannot be used over any reasonable period. Similarly, if the skill in question is one step in a sequence of instruction, then the skill should be sufficiently mastered to allow rapid learning in subsequent curricular steps. That makes sense. I find no fault in the logic. Whether improved frequencies actually lead to those ends is an empirical question, but one for which a great deal of support has been garnered (Lindsley, 1977; Binder, 1981; Haughton, 1972; Berquam, 1981, 1981; Haughton, 1980).

Unfortunately, knowledge of general relationships (improved frequency generally equals improved skill usefulness) does not always transfer easily into specific frequency aims. Several studies with "mixed results" have been reported in which higher frequency aims did not always translate into improved subsequent performance. For example, Haughton (1980) reports a case in which higher frequencies did not lead to superior retention of math skills, a finding later replicated in the Great Falls School District Precision Teaching Project (Clement, 1978). In both of those studies, the authors conclude that relatively low frequencies in math were sufficient to maintain the same low frequencies over time. Possibly those low frequencies will prove to be nonfunctional when learners attempt to apply their skills in daily life. However, that takes more time to study.

It is relatively easy to study the notion that fluency at one step in the curriculum will facilitate progress at subsequent steps. All one need do is compare the celerations achieved in successive curricular steps. If the celerations remain high from one step to the next, the pupil must have been reasonably well prepared to move on. If the celerations begin to fall off, then perhaps the aims were not high enough to prepare the pupil for advancement. Evans, Mercer and Evans (1983) employed just such a strategy and found that, "...a relationship between frequency of saying letter sounds and growth during the subsequent task of saying CVC trigrams was not clearly demonstrated." They concluded that they had not found the "optimum or critical frequency for the prerequisite skill." In other words, faster is still better, we just haven't found the "right frequency..." Maybe, but the whole issue of "prerequisite skills" and the need to develop fluency at each level in a curricular sequence is now being seriously challenged. It would appear that "step ups" and "leap aheads" to high levels in the curriculum

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* For those who might be mislead, "Uncle Owen" was not Eric's uncle. Indeed, Eric was Owen's chart father. Owen owes much to Eric, and might not ever have known of the Learner-Force had it not been for him. If Eric felt a reluctance to abandon Owen to his own fate, it was not out of familial loyalty, but rather the concern and patience which only the superfluent can have for the somewhat slow.

will often result in improved learning and (eventually) improved levels of performance, even if the pupil is advanced to those higher levels in the curriculum before earlier, "prerequisite" skills have been mastered or demonstrably acquired (Lindsley, 1981; Eaton & Wittman, 1982; Bower & Orgel, 1981; McGreevy, 1980; Johnson & Jackson, 1980; Haring, Liberty & White, 1980).

So, where are we? What aims do we establish? How do we find that "optimal frequency?"

The issue of a functional frequency aim for a particular skill and a particular learner is still empirical -- we will never know how well a performance aim prepared the learner for meaningful skill usage until we try it and see. Did the learner retain the skill? Did the learner actually use the skill in extrainstructional activities? If so, then our performance aim was at least adequate (if not more than adequate). If not, well try, try, try again (White & Haring, 1980).

The empirical approach to validating an individual's performance aim is certainly desirable and often not difficult. At times, however, it is not possible for us to follow our learners and determine how well we prepared them to succeed. Moreover, we have to have a place to start -- a star by which to guide our ship -- we have to have at least an initial aim or, as one of Eric's second graders pointed out, we'd be "aimless." Where will we find those "rising stars" to guide us in our initial attempt?

The most common approach would appear to lie in the assessment of "normal" or "competent" performers. The vast majority of published aims in the **Journal of Precision Teaching** and elsewhere are derived by assessing a pupil's peers, adults, or to rely on one or more of the "large project's" data sets (Mercer, Mercer & Evans, 1982). Why? Well, if most kids are able to make it with a certain frequency, then it ought to be good enough for our kids. That may not always be true.

Normal peers are often far from competent. Even the typical adult fails to maintain many skills at the useful level. For example, in a review of the literature, Horton (in progress) noted that approximately 98% of all adults "do not compute." They are so dysfluent in basic math skills that they let the bank or the store clerk do any necessary calculations. When they are forced to work with numbers, they turn to a calculator for even the simplest of problems. (I, myself, was one of the first to own a wrist calculator.)

Difficulty can arise even when we have confidence that the subjects of our "aim-establishing assessments" are indeed competent performers. As Haughton (1980) pointed out, in order to maintain and use a skill at one frequency, it is often necessary to learn and practice the skill at a much higher frequency. Conversely, notes Haughton, our aims may only have to bring a learner up to a level where he or she is able to practice and continue learning without our help. Haughton estimates that an "independent practice" level may be as low as divide-by-two (/2.0) of the eventual fluency desired for the skill. When we assess normal peers and adults, therefore, we may only be measuring what successful performers **do**, rather than what successful learners must do in order to **become** successful.

Where then do we go? At least three alternate approaches for setting aims have been suggested. First, one can simply shoot for "superfluency" in all basic skills. Haughton (1977,1980) has suggested 200 to 400 per minute for all basic writing and computation skills, 20000 per minute for "scanning skills," 600 to 1200 per minute for "study reading skills," and 2000 to 3000 notes per minute for competent banjo playing skills -- just to name a few of the pinpoints which interest him. Are these aims reasonable? They are certainly attainable. In at least some cases, however, one might wonder whether much lower "independent practice" or "ready to move on" aims might be more efficient for rapid movement through the curriculum (Evans, Mercer & Evans, 1983).

A second common strategy for estimating reasonable performance aims involves the assessment of "tool skills" (e.g., free/write digits as a tool for see/write digits to answer computation problems; free/say alphabet as a tool for see/say words in context). White & Haring (1980) suggest that tool skill frequencies should be at least x1.5 to x2.0 higher than "contextual use" frequencies. If one wishes a child to write digits to form math fact answers at a frequency of 80 digits per minute, the child should be able to free/write digits at a frequency of at least (80x1.5=) 120 to (80x2=) 160 per minute. Unfortunately, that strategy requires that one has already established the aim for the "use skill." To avoid that trap, one might use the same basic ratios between tool- and use-skill frequencies, but reverse the direction of computation. That is, assess the child's current basic tool skill, divide by a factor of 1.5, and use the resultant figure as the performance aim for higher level skills which use

that tool. If the pupil can free/write digits at a frequency of 100 per minute, then the aim for basic math facts might be (100/1.5=) 67 digits per minute.

The advantage in the "work down from tool skills" approach is that it is always completely defined by the pupil's own performance -- it is not necessary to establish one aim (the use-skill aim) in order to determine another aim (the tool movement aim). However, if the child is not already competent in the tool skill, performance aims for the higher level skill will just reflect that incompetence.

Other variations on the theme of tool-skill/use-skill frequency ratios have been suggested (Eaton and Hansen, 1978), but utilizing tool-skill frequencies as a method of establishing contextual use-skill frequency aims always appears to require some leap of faith -- the assumption that one knows what the use aim should be (so one can establish tool movement aims), or the assumption that the learner's tool movement frequencies are functional (so one can use them to establish higher-level skill aims).

The last strategy for establishing aims which I have seen in practice is really a method for avoiding exact frequency aims altogether. In Shawnee Mission, Kansas, Henri Sokolove encouraged a practice suggested to her by Ogi-Wan Sixcycle, the original Learner-Knight. Each pupil simply works on one step in the curriculum for as long as he or she continues to get better. When the pupil "goes flat," the next step in the curriculum is introduced. No remediation; no added cues; no artificial consequences -- just "move on." Such an approach certainly embraces two concepts dear to the hearts of Precision Teachers -- "listen to the children" (when I stop learning it means that I want something different) and "emphasize learning" (it matters not where I am, just how fast I'm getting somewhere else). To be sure, upon inspecting some of Henri's charts I was surprised at just how low some of the frequencies were (grade level oral reading at 20-50 words/minute). However, the pupils were undeniably progressing nicely through the curriculum and, more importantly, were apparently well into the "independent practice" range mentioned by Haughton (1980). Frequencies on levels of the curriculum no longer directly taught continued to improve.

Despite Sokolove's(1978) very convincing and very extensive data, I must admit that the "as long as you progress" strategy was the most difficult for me to consider. Is the learner always right? Perhaps not, at least when it comes to signaling the end of the need to learn by ceasing to learn. Still, I have become more comfortable with the idea of moving ahead in a curriculum at the earliest possible opportunity. Step aheads and leap aheads are undeniably effective ways of accelerating learning in sequential material with many learners. I am more reluctant, however, to "let the learner decide" when it comes to establishing frequency aims for terminal skills -- skills which should become immediately integrated into the learner's daily behavioral repertoire and which must be maintained and used without continued instructional support -- the end of the line, as it were, in a curricular sequence.

I am simply unwilling,as a teacher, to abdicate responsibility for ensuring that at least minimal competencies are achieved in at least some important skills. I am unwilling to stop the program in dressing just because the learner goes flat at a frequency of .02 dressing sequences per minute, for I know that such a frequency will not be tolerated in the group home. I am unwilling to stop instruction (or at least continued practice) in basic math skills just because the pupil begins to decelerate after reaching 16 digits per minute. I know that such a frequency will not be sufficient for the pupil to keep up in science class...and I suspect that the learner would not maintain or use the skill as an adult.

I feel more comfortable with a "compromise" strategy suggested by Haughton (1977). Essentially, one establishes a "minimum frequency aim" and a "maximum frequency aim." The minimum frequency aim defines the lowest performance you believe will adequately prepare the pupil for advancement in the curriculum or independent use of the skill. If the learner falters before reaching the minimum frequency aim, the program is modified in some way to facilitate continued learning. Once the minimum performance aim is reached, the learner decides what will happen. As long as the learner continues to progress, the program is continued; once the learner "goes flat," the program is ended. A maximum performance aim is set at the level beyond which the teacher/manager is not interested in continuing to work with the skill. If the learner wishes to continue to develop the skill alone, fine, but the manager discontinues formal instruction for that skill and introduces a program to develop some new skill.

Where am I now?

I'm back at square one, trying to decide what those minimal performance aims should be. Am I left with norms, fancy ratios and simple quesswork? Is there no better way to estimate what might be functional? Must we simply "try it and see," follow up, and adjust as necessary? Perhaps not.

After carefully reviewing what young Eric, Ogi-Wan, and others (including, of course, the Learner-Rebels themselves) have been trying to tell me over the years, I would like to suggest several considerations which one might make when establishing a preliminary frequency aim. For the moment, I will limit my concern to "terminal proficiency", that is, the level of performance which will make a skill immediately useful to a learner, not just as one step in a sequence, but as an independent skill in it's own right. In short, the aims discussed below are designed to allow the learner to:

[A]dvance to a level of
[I]ndependence,
[M]aintain the skill over time,
and perform some
[S]ervice of importance to the learner.

Each of the considerations which I would like to propose is based on the notion of "competition."

Peer Competition

The vast majority of performance aims are established on the basis of some form of "peer competition." One assesses what most kids do, and then assumes that if a new learner can achieve those levels of performance, the learner will at least be able to "compete." In some cases that may be quite true (e.g., athletic or academic games; competing for a position as a typist). Attempting to provide a learner with "normal frequency" might also be important socially. "Slow kids" stand out, and "differences" can lead to isolation (White, 1980). Providing the learner with the ability to compete with peers can lead to much easier acceptance by peer groups. That's nice. But "normal" is not **always** nice.

Patsy, a mildly handicapped elementary school student, had a moderate speech problem (difficulty in correctly pronouncing short vowels) that showed up in oral reading and conversation. Ruth Mundt, Patsy's teacher, decided to help Patsy develop more fluency in saying the "hard sounds" by simply having her read from a list of C-(short vowel)-C words each day. To establish Patsy's frequency aim, Ruth logically reasoned that if Patsy could say the sounds as fluently as her nonhandicapped peers, all would be well. A quick assessment of those peers revealed that an aim of 40 sounds per minute should do nicely for putting Patsy "in the middle."

As shown in Chart 1, Patsy had no real difficulty in achieving the aim of 40 sounds per minute. As her fluency approached that of her nonhandicapped peers, her errors just seemed to disappear -- usually a good sign. After discontinuing the program, however, Ruth noticed that Patsy began to slip back into her old habits. When a formal assessment was conducted a month later, Patsy had dropped to half her former fluency and the errors had come back. The program was reinstated, the "normal aim" reached once again, and after crossing her fingers, Ruth terminated the program once more. Three weeks later Patsy was up (down?) to her old tricks, so it was back to the program.

At this point, many fine behavior analysts would point out that Patsy was having difficulty in "generalizing," and that contingencies should be established in the "real world" to encourage and develop the skill where it will actually be used. In other words, Ruth should start prompting Patsy and providing corrective feedback (plus an M&M or two?) throughout the day. Fortunately, Ruth was reluctant to engage in activities which might prove very embarrassing to Patsy (when was the last time someone corrected you in front of your friends?), so she opted to try for superfluency. Ruth doubled Patsy's frequency aim ("...now Patsy, you have a problem, so you must be twice as good as those who do not have a problem..."). It took only an extra 9 days (beyond the old aim of 40 per minute) to reach the new aim. The program was terminated. A month later Patsy was still superfluent. Ruth never noticed a problem after that during reading or conversation. Undoubtedly, Patsy is now a speech therapist or a linguistic specialist in the U.G. (United Galaxies).

Obviously, "competition with peers" was not the appropriate method for establishing Patsy's aim. Ruth was diligent in following Patsy after the program to see if the new behavior was functional, however, and when her faith in the Normies failed, she studied carefully the plans of the Deathstar that young Eric had retrieved while rescuing Princess Learna. She was finally able to locate the weakspot in the monstrous Normie machine. She put her faith in the Learner-Force, and found an aim that worked.

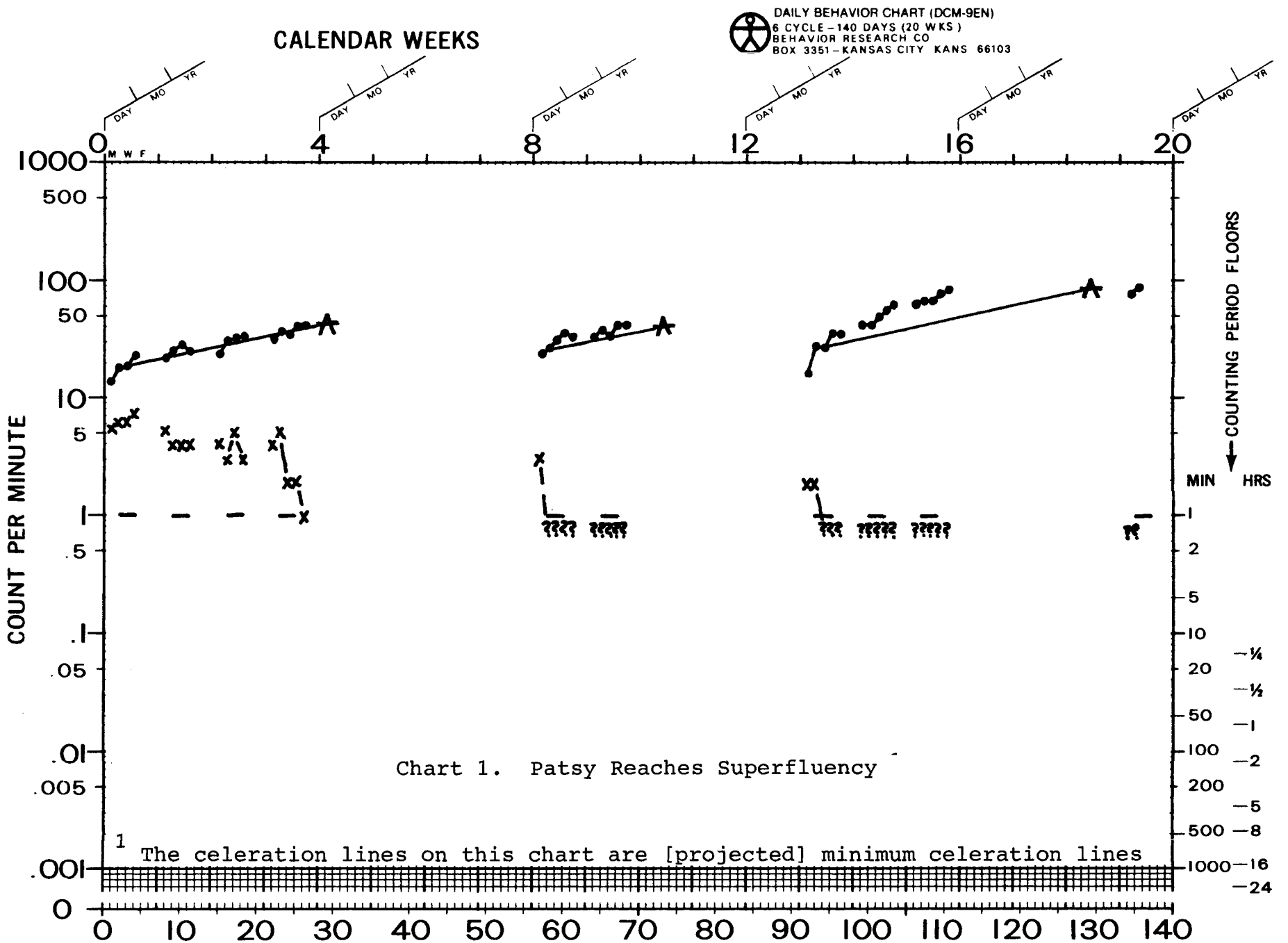

Chart 1. Patsy Reaches Superfluency

[1] The celeration lines on this chart are [projected] minimum celeration lines

SUPERVISOR	ADVISER	MANAGER		BEHAVER	COUNTED
White	Mundt		Patsy	see/say C-(short vowel)-C words in isolation	
DEPOSITOR	AGENCY	TIMER	COUNTER	CHARTER	

Amid thunderous MUSIC**, the Normie Death-star was destroyed.

How might we have guessed before the program started that Patsy needed superfluency? The clue might lie in the consideration of another type of competition, which will be examined in the next episode, "The Return of the Learner."

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** MUSIC, according to Ogi-Wan (Lindsley, personal communication, exact date unknown) represents the things we must remember about learning: learning is by (M)ultiples, not add and subtract; learners are (U)nique, what works with one learner may not work with another; learning is (S)pecific in that something may be "hard to do" but "easy to learn"; "easy to get right," but "hard to learn," etc.; learning is (I)ndependent in that corrects can go up while errors go anywhere, success in one curricular area tells us nothing about other curricular areas, etc.; and learning is a function of (C)onsequences -- you can't tell why something happened until you see what comes after it.

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Chart-sharing

MONITORING COLOR NAMING

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Kris was referred to me by his classroom teacher 2 days after beginning kindergarten. Kris qualified for therapy with numerous articulation errors and language deficits. One of Kris' first objectives was to learn color names. Since knowing color names is an important kindergarten skill, I didn't want to spend all year teaching one color name at a time.

We started with a see/say probe with 35 circles and I randomly colored the circles the 8 basic colors. Kris was instructed to name the colors for 1 minute and to skip the ones he didn't know. Our data was flat, no learning was taking place and we were both confused(see Chart 1). I decided that the circles were too abstract, that Kris really didn't understand the concept of color, and that he wasn't going to learn the color names unless we made some changes.

We constructed a new probe with 8 pictures selected by Kris and colored each picture a basic color. Kris was instructed to say a color sentence about each picture (i.e., The apple is red. The pumpkin is orange.). Therapy was directed toward identifying the basic color of the meaningful objects and pictures, and practicing through imitation of the probe color sentences. Kris learned the color sentences, and the concept of color was finally making sense to Kris and me. I could see it on his chart and his face.

Next we stepped up to the original see/say color names probe. Within 7 charted days Kris was naming colors proficiently.

Our final phase was to step-up to a 5 minute generalization (carryover) activity. Kris was asked to tell me the name and color of objects picked from a box randomly. After 4 days, Kris could perform this task at a smooth pace with no hesitation.

We both learned from Kris' chart. Kris learned his colors and I learned the value of using meaningful material when teaching and continuing to let my students talk to me through their charts.

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STUDY METHODS IN GRADUATE SCHOOL

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The purpose of this article is to share data from one student who used three different study methods to prepare for a final comprehensive written examination in a graduate level special education(mental retardation) seminar. Each study method was used to prepare for a specific topic covered in the seminar. The study methods and topics were: (1) rereading 1-2 page abstracts dealing with various conceptualizations of mental retardation; (2) writing and rereading an essay comparing and contrasting ten authors' perspectives on mainstreaming; and (3) reviewing and taking a daily timing on flashcards, with author names and publication dates on the front and with 2-3 relevant facts or ideas about observational learning from the respective authors on the back of the cards.

Many Precision Teachers endorse the use of flashcards and timings(SAFMEDS) as a highly effective learning tool. Bower and Orgel (1980) documented the effectiveness of SAFMEDS with college students.