PERFORMANCE-BASED DECISIONS: WHEN AND WHAT TO CHANGE

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This chapter was first published in a monograph in 1982 (White and Haring, 1982) and revised in 1984 (White, 1984). Only a few changes have been made in the basic decision rules since they first appeared. Originally, two sets of rules were provided — one for “high frequency” behaviors, and the other for “low frequency” behaviors. In practice, the two sets of rules have merged into a single “omnibus” set with slight modifications for distinguishing between acquisition and fluency-building with high- and low-frequency behaviors. Some modifications have also been introduced for discriminating “compliance problems.” Under the original rule structure, compliance was discriminated solely on the basis of performance variability or “bounce.” Since the rules were first published, it has also been determined that rapid deceleration of correct frequencies from “on high” (i.e., from a position at least one-cycle above the record floor) can also signal a compliance problem. Those modifications have been incorporated into this version of the paper.

INTRODUCTION

In the beginning nature provided the only education available. If a learner failed to prosper under nature’s tutelage, he or she simply ceased to exist. As the human species became more “civilized,” we developed more effective but similarly inflexible means for supporting the basic existence of our members. If a learner failed to prosper and learn under a given educational system, the learner was simply dismissed. Eventually, certain compassionate and open-minded people began to realize that children who failed in a typical educational system might still meet with success if alternative approaches were explored. Schools for the deaf, the blind, the orthopedically handicapped, and the mentally retarded began to emerge. The “system” began to respond to the needs of the children.

Initial attempts to adapt educational approaches to meet the needs of the learner were centered on the notion that children, while not all alike, could still be classified into relatively homogenous subgroups. If a child was blind, he needed “mobility” training. If a child was deaf, certain adaptations were required in the communication curricula. If a child was crippled, various occupational therapy or physical therapy approaches would be
advised. If a child was mentally retarded, the curriculum could be watered down, a ceiling imposed on expected development, and basic skills drilled in endless repetition. In retrospect, each approach was still inflexible, but at least it represented an attempt to meet the special needs of the learner. It was a start.

In the 1960’s and 70’s attempts to identify appropriate educational strategies based on observable child characteristics became much more refined and sophisticated. “Diagnostic/prescriptive teaching” uses extensive and detailed assessments to evaluate the learner’s physical well being, current levels of performance in a wide range of skill development areas, and perhaps even the child’s reaction to various instructional procedures and environmental conditions (c.f., White, 1980). The precision with which potentially affective instructional programs could be identified improved dramatically. As commonly practiced, however, the diagnostic / prescriptive approach to program development is relatively inflexible once the initial program has been devised and implemented. The learner might be reassessed every few months or at the end of each year, but between those infrequent assessments, programs are generally conducted without change. In the mid-1960’s the practice of more frequent assessment and systematic program revision began to emerge.

In an article entitled the “Direct measurement and prosthesis of retarded behavior,” Lindsley (1964) suggested that teachers could successfully apply basic behavioral methods in their classrooms. That is, teachers could carefully document the conditions under which instruction takes place, monitor daily learner progress, and identify program revision needs in a timely manner. Lindsley’s suggestions worked, and today there are thousands of teachers, parents, children, and other people using what has become known as “Precision Teaching.”

**Precision Teaching** is a set of guidelines for describing behavior, outlining the instructional plan or conditions under which the behavior occurs, monitoring the frequency with which the behavior occurs, charting the learner’s progress on a “standard chart,” and evaluating the changes which occur in the behavior with each new revision of the plan (White, 1986).

The feedback that Precision Teaching provides on the effectiveness of different instructional approaches can be very powerful in helping teachers to shape their own behaviors and become more responsive to the individual needs of each learner. If the learner’s correct frequencies are “going up” and errors are “going down,” the program can be left alone. If the learner is “flat” (not changing) or changing in the wrong direction, the program should be revised…and revised again…and again, until the learner begins to make satisfactory progress. That seems simple. There are times, however, when it doesn’t prove simple enough.
One of the advantages of Precision Teaching is its highly standardized, uniform approach to monitoring and charting the course of a learner’s progress (White, 2000c). Since the same type of chart is used to display all of the programs one might be running, it is possible to make quick and meaningful comparisons among programs and to develop a “feel” or “expectancy” as to how successful programs should look. That facilitates the formation of progress standards and, in turn, makes it easier for teachers to spot programs that need to be revised. It takes time for a teacher to develop those expectancies, however, and many teachers simply don’t work with the system long enough to reach a point where it becomes truly useful.

Even for teachers who have developed expectancies, the charted record of a learner’s progress can sometimes be difficult to interpret. Children don’t always just “march up the chart” in a nice, orderly fashion. They may progress for several days in a row and then “backslide.” Some children’s performances are so erratic that it’s difficult to determine what’s happening. Finally, even if it becomes obvious that a program is not working as it should, teachers can sometimes be at a loss as to what they might change. The net result of all those problems is that even when teachers faithfully monitor and chart the learner’s progress every day, a certain proportion of these programs may be ineffective and yet be continued ad nauseam. Fortunately, guidelines have been developed to help us interpret the instructional needs reflected in a learner’s performance record.

The rules discussed in this paper were originally developed through a series of research studies over a period of about ten years and have been evolving ever since. Specifically, they were developed to help teachers make more timely and effective decisions about when and how a program should be changed to facilitate continued learning. Before discussing the rules, however, it is important to point out that they do not replace the basic procedures of Precision Teaching. Rather, the rules discussed in this paper expand Precision Teaching make it more immediately and consistently effective as a feedback mechanism for teachers. The rules discussed here might conceivably be adapted for use with systems other than Precision Teaching, but this author is convinced that they would then be clumsy to use. It will help, therefore, to begin with a review of the basic Precision Teaching tenets.

SOME BASIC “GIVENS”

In order to derive the greatest benefit from the rules discussed in this paper, the following practices must be employed. For a more complete description and discussion of each practice, the reader should consult one of several available books on Precision Teaching (e.g., White and Haring, 1980; Kunzelmann, Cohen et al., 1970; Pennypacker, Koenig et al., 1972). A more complete list of desirable “givens” may also be found in Haring, Liberty, and White (1970-80).
Build Behavior

The primary function of a teacher is to help each learner build new skills or refine old skills. The rules which will be discussed in this paper were designed to help make appropriate and timely decisions in just that type of situation. If the teacher also finds it necessary to decelerate “challenging” behavior, the rules discussed below may still be of help in deciding whether a program is working, but they will not help in deciding what type of change to try if the program is not working.

Provide Opportunities for the Learner to Demonstrate the Behavior

To accurately assess a learner’s progress in building or refining a skill, the learner must first be given the opportunity to practice and demonstrate the skill. Ideally, situations are devised to allow the learner to demonstrate the skill at least 10 times during any given assessment. If that is not possible, the rules can be applied to low-frequency behaviors, but the results are less satisfactory. Whenever possible, try to pinpoint your instructional targets in a way that will enable the behavior frequencies to exceed 40 or more during each assessment.

Of course, concern for the number of opportunities provided for practice should extend beyond a single assessment. It is also important to provide for practice on as many days of the week as possible.

Evaluate Information Concerning both Count and Time

Teachers often monitor only the number of correct and error behaviors a child emits during an assessment and then, perhaps, translate those counts into “percentage correct” to describe the learner’s accuracy. For reasons which will become more apparent later in this paper, accuracy or percentage data alone will not be sufficient for choosing the most effective instructional procedure. Each assessment should also evaluate the learner’s fluency or “ease” with which he or she is able to complete the task. That’s accomplished by computing the “frequency-per-minute” of target skills — correct and incorrect behavior counts are divided by the assessment time in minutes. As a learner becomes more fluent, behavior frequencies go up the chart and error frequencies go down.

In many cases the evaluator imposes the length of the assessment period. We provide opportunities for the behavior to occur, count the correct and error performances, time the entire assessment session, and divide the counts by the time to find the learner’s “correct frequency per minute” and “error frequency per minute.” For example, we might allow a child 2 minutes to practice writing her name each day and count the number of correct and incorrect letters-in-sequence she makes. The behavior counts are divided by the predetermined assessment time (2 minutes, in this case) to find the fluency and accuracy of her performance. If the learner controls the length of the assessment period (e.g., she
decides “naturally” how long to interact with a peer while we count the frequency of positive, negative, and neutral comments she makes), the same basic procedures are used to determine the frequency of comments — count divided by time. The time just differs from one assessment period to the next instead of being predetermined.

Information about latency (how long it takes to begin to respond) or duration (how long each response takes to complete once it begins) might also be useful. In responding to a social greeting, for example, a child might simply say, “Hi,” or launch into a long series of questions about the other person’s health. If we’re only interested in how quickly she begins to respond to the greeting, timing the whole social exchange might not be as informative as her latency (the time between the opportunity to respond and the beginning of the response). Similarly, a 2 or 10 minute assessment of dressing skills doesn’t make as much sense as timing just how long the whole sequence takes from beginning to end (duration). Unfortunately, charting “frequency per minute,” “seconds latency,” and “minutes to complete a task” all in different ways can lead to confusion. When a learner gets more fluent, frequency goes up the chart, but latency and duration would go down.

It will be easier if we always use the standard formula for computing behavioral fluency — count ÷ time — and simply use whatever measure of “time” is most important for a particular behavior. The latency of social greetings can be converted to “start frequency” by counting all the appropriate and inappropriate responses and dividing those counts by the sum of all the “start times” (latencies). The duration of dressing can be converted to “do frequency” by dividing the number of dressing sequences or steps completed by the sum of all the times taken to complete the dressing sequences.

The advantage of converting all count and time data into frequency statements is a matter of simplicity. If a learner gets faster or more fluent, frequency will always go up the chart, regardless of whether it’s standard frequency (simple count divided by total assessment time), start-frequency (count ÷ cumulative latency), or do-frequency (count ÷ cumulative duration).

In any case, the rules presented in this paper pertain only to frequency data. The reader must determine how best those data are computed (Haring, Liberty et al., 1979).

Chart the Learner’s Progress

Most of the rules for deciding when and how to change programs require that the teachers have a clear picture of the learner’s day-to-day progress over at least the last week, and frequently for periods extending much further back. The easiest way of forming that picture is to keep a simple chart of assessment results. The rules discussed here were originally developed using the Standard ‘Celeration Chart and are expressed in terms which require that chart. The rules could be adapted for use with other types of
charts (or, indeed, no chart at all), but would be much more difficult and time-consuming for the teacher to employ. For an overview of the Standard Chart, see White (2000c).

Set Aims

The rules for deciding when a program needs to be changed will only work if the teacher has established a clear set of performance aims. For purposes of this paper, I’ll assume that separate performance aims have been established for correct and error frequencies, and that a specific date has been set for reaching those aims. Those aims will allow the teacher to decide when the learner has adequately demonstrated the skill to be taught and if the learner is progressing quickly enough to reach performance objectives within the time available. Methods for establishing performance aims have been devised (c.f., White, 2000a), but will not be discussed further here.

If each of the conditions outlined above has been met, it will be relatively simple to apply the decision rules described in this paper.

DECIDING WHEN TO CHANGE

The need for a program change should be obvious if a learner is making no progress at all. If a learner is making some progress, however, it can sometimes be difficult to decide whether the learner is progressing rapidly enough to reach his or her performance aim within the time available. Some standard for acceptable progress needs to be set. The simplest and most useful way of establishing that standard is to draw what Liberty (1972) called the minimum celeration line.

To Find the Minimum Celeration Line

(1) Draw an Aim-Star on the Chart. The instructional aim is indicated on the chart by drawing a little star at the intersection of the performance aim and the aim-date. For example, if the instructional aim is to raise the learner’s correct frequency to a level of 30 correct behaviors per minute by the beginning of the fourth week of the school year, the star would be drawn on intersection of the line which represents 30 per minute on the chart and the line which represents the desired date (see Figure 1A).

(2) Complete Three Daily Assessments of the Skills. Any single assessment of a child’s skill may be misleading. The child may not feel well, or perhaps it takes a little time for the child to understand what the teacher wants him or her to do. In order to get a reasonably accurate picture of the learner’s actual skill at the beginning of the program, it is advisable to assess the learner for at least three days.

(3) Draw a “Start-Mark” to Indicate the Learner’s Initial Skill. The results of the first three assessments are summarized by drawing a little circle, or “start-mark,” at the
intersection of the middle (second) day of the three assessments and the middle (second to lowest or highest) performance value (see Figure 1B).

(4) Draw the Minimum ‘Celeration Line.’ Having decided where we went the learner to end up (the aim star) and where the learner is now (the start-mark), it is a simple matter to describe how rapidly the learner will have to progress by drawing a line between the start-mark and the aim-star (see Figure 1C).

Two minimum ‘celeration lines are often set — one to describe how correct frequencies should accelerate and another to indicate how error frequencies should decelerate. Since an early emphasis on errors will often slow a learner’s progress, however, it is suggested that only the minimum ‘celeration line for correct-frequencies be established at the beginning of the program. Once the correct frequency aim is reached, a minimum ‘celeration line for decelerating errors may be established if accuracy still remains a problem.

Using the Minimum ‘Celeration Line to Decide If and When a Program Change Should be Made

(1) Continue to monitor the learner’s progress. Assess the learner as often as possible and chart the results.
If the learner falls below the minimum celeration line for 3 days in a row, change the program. The learner may fall below the line for 1 or 2 two days and still have little or no difficulty in reaching his or her aim on time. Generally, however, if a learner falls below the minimum celeration line for 3 days in a row, there is less than a 6% chance that he or she will still reach the aim by the date established without a change in the program (c.f., Liberty, 1972; White and Liberty, 1976); see Figure 1D.

It should be noted that a learner may progress much faster than expected, resulting in performances well above the minimum celeration line. When that happens, a learner could stop growing or even decelerate for several weeks or months before finally falling below the original line (see Figure 2). To avoid that problem, it is suggested that a new minimum celeration line be drawn whenever a learner’s performance exceeds the value of the old minimum celeration line by a factor of times-two (roughly the width of a standard wooden pencil laid on top of the standard chart). A new aim-star is then drawn on an earlier date to reflect improved expectancies. Using only the original minimum celeration line in Figure 2, the program was allowed to continue for several months after Greg had stopped getting better. If the minimum celeration line had been raised, as suggested above, the program would have been changed nearly 2 months earlier.
(3) Change the Program. Revise the instructional plan and implement the new program as quickly as possible (rules for deciding how to change the instructional plan will be discussed later). Note the change in program on the chart by drawing a heavy vertical line just before the day when the new program is put into effect (see Figures 2 and 3).

(4) Draw a New Minimum 'CELERATION Line. Since the learner has already failed to meet the old minimum 'CELERATION line, it will be necessary to establish a new standard for progress.

If the new program will still be working with the same behavior, the start-mark for the new line can be based on the last three assessments conducted under the old plan. Simply find the middle of the three frequencies that fell on the wrong side of the old minimum 'CELERATION line and indicate that middle value by drawing a small circle on the day line corresponding to the first day of the new plan (see Figure 3). If the new program will involve a step-ahead or step-back in the curriculum to a behavioral target which is much easier or harder than the old target, the start-mark should be based upon the first assessments conducted under the new plan (see Steps 2 and 3 under “finding the minimum 'CELERATION line,” above).
If the aim-date can be delayed somewhat, the new line might be drawn from the learner’s current level of performance, parallel to the old minimum ‘celeration line, until it crosses the previously established performance aim (see Figure 3). If the aim-date cannot be changed, then draw the new line from the current level of performance to the old aim-star (see Figure 4). Daily assessments are then continued, and the rules described above are employed with the new minimum ‘celeration line to decide if any further changes are needed.

Does the Minimum ‘Celation Line Really Help?

Yes, the minimum ‘celeration line can significantly improve the chances that timely decisions will be made and, in turn, that those decisions will result in improved learner progress. In one study (Bohannon, 1975), teachers were more than five times more successful in remediating skill deficits when they employed the minimum ‘celeration line than when they did not. In another study (Mirkin, 1978), learners in classes where minimum ‘celeration lines were used consistently achieved higher rates of progress than learners in classes where those procedures were not used. Those other teachers less effective even if they were collecting and charting daily assessment information, but didn’t use specific rules for deciding when to change the program.
DECIDING WHAT TO CHANGE

If and when a program change becomes necessary, there are several different ways to revise a program. The most common strategies include:

1. **Stepping back** to a more basic, earlier skill;

2. Revising instructions, cues, prompts, materials, or feedback strategies in an attempt to provide more information about how the task should be completed;

3. Providing more powerful reinforcers or consequences in an attempt to increase or maintain the learner’s incentive to work; or

4. **Stepping ahead** to a more advanced skill on the assumption that the learner needs “greater challenges.”

Any one of us is likely to prefer only one of the strategies listed above, and try something else only if our preferred strategy meets with consistent failure. The most commonly preferred strategy is stepping back (Haring, Liberty et al., 1970-80), possibly because it is more comforting to assume that the current task is too difficult for the learner, rather than question the effectiveness of the basic instructional plan. In fact, however, no single strategy is likely to be consistently successful, and even if a plan meets with initial success in promoting learner progress, it may lose its effectiveness as the learner’s needs change. The decision rules discussed below have been designed to assist the teacher identify the actual instructional needs of the learner at any given point in time; and to select the type of program revision which is most likely to meet the learner’s changing needs.

Phases of Learning and Changing Instructional Needs

In the process of mastering a skill a learner will pass through several different phases of learning: acquisition, fluency-building, application, and adaptation. Each new phase will impose somewhat different demands upon the learner and, in turn, may require adjustments in instructional strategies if continued progress toward mastery is to be realized. This manuscript will focus on only the first two phases of learning — acquisition and fluency building — and several of the problems we might encounter during those phases of learning. Information about skill application and adaptation are discussed elsewhere (c.f., Haring, Liberty et al., 1988).

**Acquisition.** A learner must first acquire basic competence in performing a skill correctly — she must learn how to perform the task. If the learner runs into difficulty during this phase of learning, revisions in the instructional plan designed to provide the learner with more information (e.g., cues, prompts, corrective feedback) are most likely to be successful. While “motivation” may also be a problem, arranging only for more
powerful reinforcers when the learner simply does not know what to do is very unlikely to be sufficient.

Fluency building. It is not usually enough for a learner to simply acquire a skill. Practice with the skill must continue until the learner can perform the task easily enough to make it useful. The level of fluency required to make a skill useful is usually based on some form of competition, but not necessarily in the traditional sense of the word. Competition with peers may play a role with some skills (e.g., athletic or academic games), but more often than not, the fluency standards for most skills will be determined by the patience of other people or the fluency of competing behaviors in the learner’s own repertoire. For example, if a child’s parents have only 15 minutes to see that their child is dressed in the morning, the child must meet that fluency standard or the parents will simply run out of patience and dress their child themselves. Similarly, if it is easier for the child to tie his shoe laces in a knot than to struggle to make a bow, the knot is likely to win out. Additional factors to consider when setting fluency standards have been discussed by White (2000a).

Simple drill and practice is usually the most effective way of building fluency — just have the learner perform the task over and over again. Drill can be very boring, however, so if the learner appears to be having difficulty during the fluency building phase of learning, it will probably be necessary to arrange for more powerful reinforcers or consequences — something to make the continued drill and practice worthwhile. Adding more instructional events (cues, prompts, etc.) may just bore the learner. After all, the child may know pretty well what to do, he or she just needs a reason to keep doing it.

A “reason to keep going” is, of course, also likely to be important during skill acquisition, but good information about how to perform the skill is likely to be more important. Similarly, corrective feedback and good cues might be necessary during fluency-building to get rid of a few lingering errors, but consequences are likely to be more important to maintain the learner’s interest. When we plan our instructional approach, therefore, it will help to identify the learner’s current phase of learning.

Identifying the Phase of Learning

Common sense might dictate that a learner would remain in the acquisition phase of learning until he or she was 100% successful in completing the task accurately, then pass into the fluency building phase of learning. If that were the case, it would be possible to decide which strategy would be most likely to work by simply assessing the child’s accuracy. As it turns out, most learners begin to pass from acquisition into fluency building long before all the steps in a task have been fully acquired. Just because a child does not know all the letters in the alphabet does not mean that he cannot begin to build fluency with those already learned. The learner might also have actually acquired all the
steps in a task and simply make careless errors. A learner often reaches a point where the strategies appropriate for fluency building (increased attention to consequences) become more important than strategies appropriate for acquisition (better cues and corrective feedback) long before the learner demonstrates 100% accuracy. Even if the teacher has no real interest in fluency, therefore, it may become necessary to attend to that phase of learning in order to reach a point where the learner reliably demonstrates the skill with an acceptable level of accuracy.

To complicate matters further, it is possible for a learner to be 100% accurate on some tasks and still not really have acquired the desired skill. For example, rather than learning basic addition facts, a child might use elaborate counting strategies to solve math problems. That’s hardly what we mean by “knowing her facts.” Even if she’s 100% accurate, therefore, a continued emphasis on basic instruction (cues, prompts, feedback) might still be necessary.

Fortunately, things are not quite as hopeless as they might seem. There are some relatively simple rules for determining a learner’s phase of learning and deciding which type of program is likely to be effective in promoting continued progress. Before presenting those rules, however, it will be helpful to review a few procedures for describing the learner’s performance.

Describing Patterns of Learning

Four aspects of a learner’s performance are important for evaluating his or her needs: (1) the trend or progress in correct performance over the past six assessments; (2) the variability in correct performances; (3) the ratio of correct to incorrect performances; and (4) the overall fluency of correct performances.

Trend in correct performances. A line should be drawn through the last 6 correct performances to indicate whether they are generally increasing, remaining the same, or decreasing over time. Useful procedures for drawing the trend line are summarized in Figure 5. More detailed instructions for drawing lines can be found in White (2000b).

(1) Find the intersection of the middle-day and the middle-performance value for the most recent 3 assessments. Use the procedures described earlier for finding a start mark, but use them with the last three assessments instead of the first three assessments on the chart.

(2) Find the intersection of the middle-day and middle-performance value for the first 3 of the most recent 6 assessments (i.e., the 4th, 5th, and 6th most recent assessments on the chart).

(3) Draw a straight line passing through the two intersections found in steps one and two, above. That line will, in most cases, be a fairly accurate summary of how the correct performances were changing over the past six assessments.
If the line of progress for the correct performances is going up or down the chart, it will be necessary to note whether the slope of that line is “steep.” Generally, a trend can be considered steep if it represents a doubling (times-two) or halving (divide-by-two) in performance over any given week. As a point of reference, a straight line from the lower
left-hand corner to the upper right-hand corner of the standard behavior chart represents a times-two line (doubling each week); and a line drawn from the upper left-hand corner to the lower right-hand corner represents a divide-by-two (halving each week) (see Figure 6). By drawing or visualizing those lines on the chart, it is relatively simple to compare the learner’s actual trend with those standards and determine whether the change in correct performances can be considered steep.

**Bounce or Variability**. Most children have good days and bad days, but overall, the change in performance from day-to-day should be relatively stable. If a learner’s performances are especially “bouncy” or variable, serious questions arise concerning the power of the instructional program to solicit the learner’s attention and best performances. That is an important consideration when selecting intervention strategies.

Generally, performances are considered acceptably stable if they bounce up and down by a factor of less that times- or divideby-2 from one day to the next. If the standard chart is being used, a standard wooden pencil happens to be about as wide as a x2 change on the standard chart. Place a pencil on top of the line of progress and move it up or down to cover as many of the correct performances as possible over a one or two week period. If most or all of the learner’s performances can be hidden by the pencil, the learner’s performance pattern can be considered acceptably stable. If several correct performances “peek out” from under the pencil, the learner’s variability should be
considered unacceptably high (see Figure 7). It should be noted that although the width of a standard pencil represents roughly a x2 change on the standard chart when it’s perfectly horizontal on the chart, the magnitude of the change represented would increase as the pencil is rotated to steeper and steeper angles. Functionally, however, the difference does not seem to be important. The “pencil test” still seems to work quite well.

Generally, high variability or bounce should only be assessed when the overall typical frequency for the behavior is roughly times-10 (x10) above the record floor. When the frequencies are closer to the floor, the behavior counts are too low for a meaningful assessment. Also, “down bounce” (a sudden but temporary large drop in performance) is usually not considered as important as “up bounce” (a sudden but temporary large increase in performance). Too many factors, like fatigue or temporary illness, can cause behavior to be suppressed for a day or two without being a cause for concern. A sudden but temporary rise in performance, on the other hand, usually means that the learner is capable of much better performances than we have typically observed. We should try to find out why she isn’t reliably sharing that skill with us. Finally, when trying to judge the power of a program to maintain a learner’s interest and best performance, variability in correct performances seems much more important than variability in errors. When using the decision rules, therefore, concentrate on the bounce in correct performances, not the bounce in errors.

Accuracy. Although most of the information required to identify a learner’s phase of learning relates only to correct performances, some information will also be required concerning the overall accuracy of the learner’s performance.

The level of accuracy displayed by a learner when making the transition between acquisition and fluency-building will depend upon the skill being evaluated. If a fluent person can demonstrate the skill at a frequency of 40 correct behaviors per minute or better, the transition between acquisition and fluency-building can occur when accuracy is as low as 67% (i.e., only 2 correct behaviors for every error). If the skill being evaluated cannot be performed that rapidly, the learner might have to be at least 83% accurate (i.e., 5 correct behaviors for every error) before making the transition between acquisition and fluency-building.

To evaluate a learner’s accuracy, percentage statements could be calculated for each assessment, but if the Standard Behavior Chart is being used, there is a simpler way. The distance on the standard behavior chart between the frequency lines of 1 and 2, and 1 and 5, represent 67% and 83% accuracy, respectively. Whenever correct and error performances are as far apart as the 1 and the 5 lines, the learner is at least 83% accurate. Whenever they are as far apart as the 1 and 2 lines of the chart, the learner is at least 67% accurate. By marking those distances on a slip of paper, and then passing the paper over
the learner’s frequencies, we can easily determine whether the learner has met either of those basic accuracy standards (see Figure 8).

Correct frequency. If a typical fluent person can perform the skill at a frequency of 40 correct behaviors per minute, the transition from acquisition to fluency-building tends to occur when correct frequencies are between 14 and 20 per minute. That seems to hold true regardless of the overall level of fluency a person might achieve. For example, young children who are fluent in saying the alphabet can recite it at about 200 to 400 letters per minute (i.e., say the whole alphabet in about four to eight seconds). A young deaf child might be considered acceptably fluent in signing with a correct frequency of only 50 or 100 signs per minute. Both of them will tend to make the transition from acquisition to fluency-building when their correct frequencies are between 14 and 20 per minute (i.e., when the learner is making correct responses about once every 3 or 4 seconds). That rule seems to work for a very wide range of skills, from steps taken while walking to oral reading; and from sorting blocks to making complex signs. It is not clear why that might be the case.

When classifying a learner’s correct frequency, focus on her best performance in that step of the program, no matter how long ago that might have been. Learners will often “skirt the edge” of fluency building and then slide back into poorer performances,
probably out of boredom. Looking at only the most recent performances could be misleading.

The Decision Rules

Once the learner’s performances have been described in terms of the variables outlined above, it should be possible to make a fairly accurate determination of the learner’s current phase of learning and, in turn, to choose the instructional strategy which is most likely to promote continued learning. The rules were originally developed during the mid 1970’s through an analysis of learning records from classrooms serving learning disabled children (White and Haring, 1980; White and Liberty, 1976). Those rules were later found to be predictively valid with the progress records of several thousand normal children (Sokolove, 1977).

New insights were gained when the original rules were applied in classrooms serving children with severe disabilities (Haring, Liberty et al., 1980). First, many of the instructional targets in classrooms serving children with severe disabilities could not be performed at the same high frequencies as those found in classrooms serving children with mild disabilities or typically developing learners. For example, children simply cannot tie shoes as rapidly as they might write letters or say words. While the high-frequency academic behaviors initially studied seemed to make the transition from acquisition to fluency-building when the learner was only 67% accurate, the transition with relatively low-frequency behaviors seemed to require a higher level of accuracy (e.g., 83%). Second, many learners with severe disabilities displayed a great deal of variability in their performances from day-to-day. Those learners tended to be unpredictable until special programs were developed to improve “compliance” and their responsiveness to instruction. These new circumstances led to a revised set of decision rules (Haring, Liberty et al., 1970-80).

Originally, two sets of rules were used — one for high frequency behaviors, and a second for low frequency behaviors. However, as there appears to be only one point in the decision-making process that is effected by the low/high frequency distinction, it has been possible to integrate the two sets of rules for presentation in this manuscript.

OVERVIEW OF DECISIONS AND STRATEGIES

The following is a brief overview of the various decisions that the diagram in Figure 8 might prompt. It is important to consider the decision rules in sequence. For example, a deceleration in correct responding could be associated with compliance problems or a basic format problem. Deceleration of correct responses in the case of a compliance problem must be “steep.” No mention of any such a criterion is made in discussions of format problems because if that condition prevailed, it would have lead to the
identification of a compliance problem earlier in the decision rules. Always work through the rules in the sequence with which they are presented.

Figure 9: Washington Decision Rules
Decision #1 — PROGRAM WAS A SUCCESS: Move on to a new program

It is very common to set aims like, “3 Out of 5 days at 80%.” The rationale for requiring more than one day at aim is usually to provide assurances that the learner has really mastered the task at hand and is ready to move on. However, requiring more than one day at aim might only force the learner to move more slowly through the curriculum than would otherwise be possible. Experience has also shown that many learners will lose interest after one or two days of reasonably competent performance, and may actually worsen if asked to stay at that level of the curriculum longer without an effective consequence for doing so. It is suggested, therefore, that a reasonably high fluency aim be established and that only a single day at that performance level be required before moving on to something more challenging. If the learner encounters difficulty in the next step of the curriculum, or fails to maintain or generalize the new skill, the old program can always be reinstated. If it does become necessary to reinstate a program, a higher fluency aim should probably be set, rather than simply requiring more days at the old performance aim.

Decision #2 — PROGRAM IS WORKING: Don’t change

If a learner is progressing nicely, the program should be continued without change. That makes sense. Actually, of all the rules discussed in this paper, this rule is the least likely to work. It seems that there is a relatively high probability that a program that proves effective one week is likely to lose its effectiveness the next week. As long as things go well, however, we might as well leave well enough alone.

Decision #3 — INSTRUCTIONAL STEP TOO DIFFICULT: Step/slice back to something easier

When a learner fails to progress, most teachers are inclined to step back to some easier skill. It is such a favorite strategy that many learners have had their programs sliced into steps too small to have any real meaning. After all, just how useful and interesting is “pick-up shoelace” within the overall task of “dressing,” or “plus-one’s” in the overall task of addition? Rather than continually stepping back to easier levels of the curriculum, it is usually best to make every attempt to teach larger, more meaningful task units.

When working with high frequency behaviors we should not step back to an easier task unless there have been NO correct performances over a period of no less than five days. If the learner makes even one correct response in five days, an attempt should be made to stay at that level of the curriculum and find other ways of promoting progress. That rule is at variance with “conventional wisdom,” but it seems to work more often than not. It’s likely that we’ve been breaking down tasks into such small components for so long that we’ve reached an absurd level of detail. Stepping back further simply won’t
help. Whenever possible, therefore, teach the “whole task” at once, and resist any temptation to break a task into smaller parts.

Decision #4 — COMPLIANCE PROBLEM: Step ahead or provide better consequences

Learners do not always try as hard as they might or share their best performances with us. A learner’s actual level of skill or knowledge may be much higher than indicated by an assessment. A learner might perform poorly due simply to “under-programming,” or “lack of challenge,” rather than an inability to perform the task. Several performance patterns tend to indicate such a problem.

First, correct performances might be highly variable (too “bouncy” to be covered by a pencil), suggesting that on some days the learner is willing to perform, while on other days it is simply not worth her time. Second, if a learner becomes bored with a program, correct frequencies might fall off sharply. That decline could take place over several days or a week (see the discussion of “steep deceleration” earlier in this paper), or it may all occur within the space of one or two days. For example, if a learner began with a correct response frequency of 20 per minute with less than 5 errors, then immediately switched to 15 errors and 10 corrects by the second or third day, we must suspect that the learner has simply lost interest.

To qualify as “steep deceleration” or an “abrupt crossover,” a worsening in performance should begin with a relatively high correct response frequency (i.e., a frequency based on a correct count of about 10 or more). If correct response frequencies were never very high, then perhaps the problem is basic acquisition (see Decision #6, below).

We can try to correct compliance problems by providing more powerful consequences or reinforcers like praise, free time, or tokens. We essentially try to “buy the learner’s interest.” However, long range success is usually more easily achieved by moving ahead in the curriculum to make the task itself more challenging, more functional, and more intrinsically reinforcing. We can sometimes achieve the same thing by “tightening up on the contingencies.” Instead of allowing a learner five seconds to begin a task, for example, we might allow only one second.

Once a compliance problem has been identified, we need to always be suspicious of the learner’s compliance, no matter how well things seem to be going. It’s possible, for example, that a learner seems to improve after an intervention for compliance, but really doesn’t. High variability in correct performances and rapid deceleration might disappear, but the learner might still not be sharing her best performance with us. After giving the learner about 5 days to improve following an intervention for noncompliance, we should examine the correct frequencies very carefully. If the latest correct frequencies are
significantly higher than earlier correct frequencies, all might be well. If the learner has not really improved very much over earlier “highs,” however, compliance might still be a problem.

Decision #5: FLUENCY-BUILDING PROBLEM: Provide better consequences

As a learner gains basic competence in performing a skill and begins to make the transition between acquisition and fluency-building there is a good chance that she will “go flat” or even get worse from day-to-day. Fluency is most commonly achieved through practice, but repeated practice can be boring. Consequences, or a “reason to keep going,” become especially important during the transition to fluency-building.

The transition to fluency-building will be signaled differently for low- and high-frequency behaviors. To decide which part of the decision rules to use we ask whether a competent person could perform the skill at a frequency of 40 or more correct behaviors per minute. For example, competent people can “take steps,” “read words,” “write digits,” and “start greetings” at a correct frequency of 40 per minute or more. The frequencies of “steps completed while getting dressed” and “successful uses of the toilet” are much lower. When dealing with “high frequency” behaviors, we determine whether the learner is making the transition to fluency building by asking whether she ever achieved a correct fluency of at least 14-20 per minute and 67% accuracy (a 2:1 accuracy ratio). With low frequency behaviors we only ask whether the learner has ever been at least 83% accurate (achieved an accuracy ratio of 5:1). If the answer to the appropriate question is “yes,” we assume that any problems the learner is encountering have something to do with fluency-building. If the answer is no, we pursue other alternatives.

It’s important to note that not all behaviors will fall easily into either the “high frequency” or “low frequency” category. We can calculate a “do-frequency” for “runs 3 km race,” for example, but we’d run into problems fitting the result into either a high- or low-frequency framework. Certainly it is not possible to complete 3 km runs at a correct frequency of 40 per minute or more, so it would seem that the low-frequency rules would be used. However, we’re not likely to run a minimum of six, 3 km distances a day, so we couldn’t really apply the “83% accuracy” rule, either. If we counted “steps taken to run a 3 km distance” the behavior immediately becomes “high frequency,” but it is unlikely that most runners would ever fall below 20 correct steps per minute. What does that mean? Quite simply, in most cases, behaviors like “steps taken during 3 km run” are always in the fluency-building phase of learning, and improved progress is dependent upon adequate consequences to make continued practice worth while. On the other hand, for certain people with disabilities, or super-athletes trying to make precise adjustments in running style, special criteria used for judging each step might very well yield relatively low correct frequencies and relatively high error frequencies, making the high-frequency decision rules very relevant. If you have difficulty in deciding which, if either,
set of rules to apply, consider carefully what you are counting. If you adjust the target of your assessment (e.g., from “runs 3 km distance” to “takes steps to run 3 km distance”) you might find it easy to select the appropriate decision rules, and find the rules helpful in designing programs to encourage improved performance.

Since learners may actually worsen when they reach the fluency building phase of learning, it is important to look at the learner’s best performances within a phase, not just the most recent performances. If the learner ever achieved a correct frequency of 14-20 per minute (or better) with at least 2 correct responses for every error (67% accuracy) with the skill in question, we should assume that the learner is ready for fluency building. With low-frequency behaviors (behaviors that cannot be performed at 40 per minute or better), transition to fluency building tends to occur when the learner is about 83% accurate. Again, look for the learner’s best accuracy when making those judgements.

Decision #6: ACQUISITION PROBLEM: Provide more information, better cues, direction, or corrective feedback

If a learner’s performance is too low to be considered on the threshold of fluency building but not so poor as to suggest the need for a step-back to something simpler, the pattern of correct and error performances should be examined carefully. When correct frequencies are going up, or at least “flat,” it’s likely that the learner is in the acquisition phase of learning, and the instructional plan should be revised to provide the learner with more guidance. On the other hand, if the correct performances have been worsening, we need to see whether there is any evidence that the learner used to understand what to do, but has become “confused.”

Were the correct performances consistently above errors earlier in the program, but no longer are? If so, there’s a good chance that we’ve somehow taught the learner that there really isn’t any meaningful difference between correct and error performances. The easiest way of doing that is to provide equal levels of “encouragement” regardless of how the learner performs. If the learner performs correctly, for example, we might say, “Good job!” If the learner performs incorrectly, in an effort to avoid disappointment we might say, “Nice try!” with equal enthusiasm in our voice. After a while, the learner might decide that it doesn’t really matter whether they’re right or wrong, we seem happy with them regardless of how they do. They might have once had at least some inkling of the difference between correct and incorrect performances (i.e., the correct frequencies used to be consistently above errors), but now they’re not so sure. The correct and incorrect frequencies become “muddled,” with correct and error performances at about the same overall frequency. If that’s the case, then we should conclude that there is a “basic format problem” (see Decision #7, below).

If correct performances were never consistently better than errors and we’ve ruled out a fluency-building problem, then we should alter the program to facilitate skill
acquisition. Basically, the learner needs more information about how to perform the task. That information could be provided with enhanced directions, better cues or prompts, more assistance, or more explicit corrective feedback. Care should be taken, however, not to provide so much assistance that the task actually becomes a much simpler, earlier level in the curriculum. For example, the addition of ongoing, continuous physical assistance throughout a task usually represents a “step back to an easier level,” rather than simply providing more information. A step-back should only be taken if the performance patterns were poor enough to warrant it (see Decision #3, above).

Decision #7: Poor Format: Differentiate More Clearly Between Correct Response Errors

As mentioned earlier, it’s possible to confuse our learners. That is most likely to happen when the feedback we provide following errors is very much like the feedback we provide following correct responses. Always providing encouragement might seem like the “supportive” thing to do, but it can also confuse the learner and make it appear that everything she does is correct. If a learner begins with correct performances above errors and then the correct responses and errors appear to “muddle together,” it’s wise to assume that our feedback is not clearly communicating what we expect or want. We should change the instructional plan to differentiate more clearly between correct and error performances. We could do that by increasing the reinforcement for correct responses, and/or eliminating the reinforcement available for incorrect responses. It might also be helpful to arrange at least a mild decelerating consequence for errors (e.g., repeated drill on errors until they are corrected). Providing clearer prompts or cues in an attempt to avoid errors, or (as with compliance problems), “tightening up” on contingencies by allowing less time for responding and providing feedback more quickly, might also be helpful. We don’t need to punish errors, but we should make it clear to the learner when an error has been made.

DO THE RULES WORK?

Yes, the rules appear to allow relatively precise predictions about the success or failure of various instructional strategies for promoting continued learner progress. For example, Sokolove (1977) found that the rules predicted learner progress in all but 76 cases out of approximately 3300 instructional programs conducted with typically developing children. Haring, Liberty, & White (1970-80; 1980) demonstrated that some 31 teachers serving learners with severe disabilities were more than 2.2 times more successful in picking successful remediation strategies when they used the rules than when they did not. Moreover, they found that teachers could acquire the skill to apply the data decision rules effectively and efficiently in as little as three hours. Of those teachers who actually tried the rules in their classrooms, 93% found the rules valuable.
enough to say they would continue their use after they no longer received any special encouragement or support to do so.

For all their apparent worth, however, there are at least two possible problems with the current rules. First, they were developed through a careful analysis of what actually happens in classrooms. They were “empirically derived” to reflect reality, not some over-riding theory. While that might seem fine on the surface, there is also a good chance that the rules are “time-bound.” As curricula, basic instructional strategies, and teacher/learner expectations change, the value of the existing rules might very well diminish. It is important that we continue their evolution at a pace commensurate with the rest of our educational practices.

Second, the rules will be wrong at least some of the time. Haring, Liberty, & White’s research suggested that many good teachers will only select an effective remediation strategy about 33% of the time if they do not have performance-based rules to guide them. With the rules described in this paper, those same teachers can be 84% effective in selecting strategies that work. That is a significant improvement, but is a long way from perfection. It is important that we as teachers do not abdicate our responsibility for assessing and evaluating a wide range of options. Rules were meant to be broken — not capriciously, not without conscious deliberation, but sometimes. We must remember to use the rules as the guidelines they were meant to be, not as absolute dogma.

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