Chapter 6

Rules for Data-Based Strategy Decisions in Instructional Programs

Current Research and Instructional Implications

Norris G. Haring, Kathleen A. Liberty, and Owen R. White

Instructional programs designed to teach new behaviors or to improve performance of previously learned behaviors should be individualized and should provide for frequent collection of performance data and program modification based on those data (Baldwin, 1976). Information about designing individualized instructional programs is available to classroom teachers (e.g., Haring & Bricker, 1978; Smith, 1968; Snell, 1978; York & Edgar, 1979). Information regarding the collection of performance data is also available (e.g., Snell & Smith, 1978; White & Haring, 1976). However, information about how to use performance data to make strategy decisions in instructional programs for the severely handicapped is usually not available to teachers.

Researchers were generally the first to be interested in utilizing performance data to make decisions regarding the effects of experimental interventions. Performance data were analyzed visually rather than statistically. Generally, the use of traditional statistical analyses was avoided for several reasons. First, such analyses seemed to mask the effects of treatments on individual subjects and, second, statistical significance was not always equivalent to practical significance (Kazdin, 1976; Sidman, 1960). Visual analyses of charted or graphed data generally replaced statistical analyses (Hersen & Barlow, 1976; Kazdin, 1976). Researchers emphasized the examination of trends or changes in performance over time in the analyses.

When classroom teachers began collecting data, they were taught to use
visual analyses of charted or graphed performance data in order to make decisions about the effects of various instructional strategies in much the same way the researchers did (Duncan, 1971; Johnson, 1971). Unfortunately, individuals may interpret identical data differently (White, Note 1). Following the development of simple analytical tools, such as a uniform method of summarizing change over time, the reliability of interpretation of visually inspected data improved (Kazdin, 1976; White, Note 1). Even with such analytical tools, however, Liberty (Note 2) found that teachers trained in the use of such analytical tools did not use the data to make instructional changes in ineffective programs.

As a result of these findings, decision rules for use with direct performance data were developed to provide information to teachers about when to change an instructional program (Liberty, Note 2; White & Haring, 1976). In order to use these rules, classroom teachers set performance aims and selected a target date by which the aim was to be met. Then, a line was drawn, on a calendar-synchronized chart, from the student's present performance at the current date to the intersection of the desired performance aim and the target date. The line produced on the chart thus described the minimum acceptable change required to move the student from current to desired performance levels. Thereafter, as data were collected and charted, each day of data was compared with the "line" to see if it met the change aim, or "minimum 

change line." If performance failed to meet the 

celeration aim for 3 consecutive program days, it was recommended that the teacher change the instructional program.

Studies have tested the effectiveness of these rules when applied to programs for mildly handicapped persons. In these studies, mildly handicapped pupils whose teachers applied minimum celeration rules to make instructional strategy decisions generally showed greater progress gains than students whose teachers did not use the rules (Bohannon, 1975; Mirkin, 1978).

The minimum celeration rules do, however, help teachers select the strategy with the highest probability of promoting pupil progress. The minimum celeration rules state that a change should be made if the student fails to meet the change aim (line) for 3 consecutive days. What type of strategy change in instructional procedures should be made? Educators have suggested a wide variety of strategies to try when a student's performance fails (e.g., Bricker & Dennis, 1978), changing the prompts and cues (e.g., Panyan, 1972), or changing the setting in which instruction occurs (Panyan, 1972). In addition, an informal examination of several hundred projects involving mildly handicapped students showed that these, and many other types of tact changes such as changing consequences and schedules of reinforcement, have been employed. In some cases the strategy chosen was successful in promoting learning; in other cases, the tactic failed to facilitate progress.

The first attempt to determine performance-based strategy change rules empirically was based on a post-hoc analysis of several hundred projects with learners labeled mildly handicapped and learning disabled. Several performance variables were examined: the level or frequency of correct performance, the change in correct performance during the period of time in which a particular tactic was in effect, the frequency of error responses, and the change in errors over the same period of time. These variables were compared with the pupils' performance prior to the introduction of a strategy. The informal analysis showed that changes in antecedent events had the highest probability of being successful if they were introduced when correct performance was either showing no growth or was decelerating, the frequency of corrects was less than 20 per minute, and errors were at or about 10 per minute. Antecedent changes introduced when correct performances were higher and error performances were lower did not seem to be as effective. On the other hand, consequent changes were most successful when corrects were either showing no growth or were decelerating, the frequency of corrects was equal to or greater than 20 per minute, and errors were below 10 per minute.

Changes made in the antecedent cues, prompts, demonstrations, and so on, usually were designed to provide information to the learner on how to respond, and thus might be predicted to be more effective at lower performance levels. Consequence changes, which motivate performance, were more likely to be effective when the behavior had acquired the behavior but was not proficient. These results made possible the beginnings of a functional definition of phases of learning. Each phase, theoretically construed in a hierarchy to include acquisition, fluency building, maintenance, generalization, and adaptation, would be differentiated on the basis of the instructional tactics with the highest probability of facilitating learning if learning faltered. Decision rules would permit classroom teachers to identify the stage of learning from pupil performance data and select an intervention strategy accordingly. The first strategy decision rules were based on the informal analysis described above (White & Haring, 1976). No formal test of these strategy rules has been reported, although Sokolov (Note 3) investigated performance data for 3,000 students in regular classrooms K–6 and found supportive evidence for the classification of faltering performances at 20 corrects per minute as consequence problems.

In 1975 the present authors began an investigation designed to determine empirically based strategy decision rules for use by teachers and therapists working with learners labeled severely or profoundly handicapped. A number of specific studies were conducted during the first 2 years. Generally, however, teachers were left on their own. Teachers and research staff collected daily data on a variety of instructional programs to document pupil progress. Data generally included both a measure of accuracy (correct and error) and of time (e.g., rate), although some adjustments in data collection procedures were made to allow for interruption of performance time by manager manipulations and antecedent and consequent events. The data were then charted and teachers were allowed to

1The most frequently collected data type was rate, either collected in the usual method (cf. White & Haring, 1976) or adjusted. Since then, however, the necessity for collecting the other two principal types of time based data, latency and duration, has become evident. Currently research on the use of these data types to monitor pupil progress is underway.
determine for themselves if and when each program should be changed and, if a program was changed, the type of change that would be made. It was hoped that, by not restricting the frequency and types of changes teachers made, information concerning a wide range of both successful and unsuccessful program change strategies might be obtained.

During these first 2 years, 20 pupils and 14 teachers participated. The pupils ranged in age from 3 years to 21 years. All had been classified as either severely or profoundly handicapped. Many had secondary handicapping conditions (e.g., cerebral palsy, hearing impairment or deafness, visual impairment or blindness, seizure disorders, motor disorders, motor involvement), and many received regular medication which probably interfered with learning. In short, the subjects under study were in many respects typical of the general populations of severely and profoundly handicapped pupils.

The pupil performance variables examined included the level, or frequency, of correct and incorrect performances, the direction of change in performance over the 5-day period preceding an instructional strategy change, and the variability, or bounce, in correct performance. Together, these variables were considered "learning patterns." Twenty-three different learning patterns were identified from the 247 instructional phases resulting from the first 2 years of project activities (see Figure 1).

Analyses were then conducted to determine the effects of the instructional changes made by the teachers. Any change that produced either an immediate increase in level or an acceleration of correct performance was considered a successful change, as long as errors did not also increase (\( \leq \times 2 \)). Changes that produced no effect or that actually decreased correct performance and/or increased error performances (\( \geq \times 2 \)) were considered unsuccessful.

Learning patterns were then grouped according to the type of strategy change that was generally most successful. For example, with a pattern of corrects decelerating, and errors higher than corrects, and also decelerating, and both performances at 10 or less, the changes that were most successful in improving correct performances were changes designed to provide information to the learner about how to perform the behavior by changing or adding prompts, cues, and so on, or by changing or coding the instructional materials. This particular learning pattern was placed in a category with other patterns in which similar changes were successful in improving performance. Together, these six learning patterns were grouped into a category of learning patterns, which was called "Antecedent Changes" since the beneficial changes were generally changes designed to provide information on how to perform. Learning patterns in this category are shown in Figure 1. Six percent of the instructional phases fell into this category.

Approximately 28% of the learning patterns generally showed high frequencies of correct responses and low frequencies of error responses, with little bounce. In most of these cases, changes in consequences were effective in improving correct performances. However, in some cases other strategies proved successful in facilitating fluent responses, including some antecedent changes (e.g., telling the student to "go fast"). Sometimes consequence changes were not successful (e.g., changing from praise to juice as a subsequent event for corrects). In general, however this category was similar to the "Fluency-Building Problems Category" determined from the data on the performance of the mildly handicapped.

Sometimes changes produced an unsuccessful effect. An examination of the patterns involved in these cases showed that changing an instructional program in which corrects were accelerating was likely to produce a deceleration of corrects. In other words, if correct performance was accelerating and was at a higher level than errors, regardless of the frequency and trend of errors, the instructional program should not be changed. If a change were made, it was likely to produce unfortunate results. Five patterns, a total of 48% of the phases, fell into this category, labeled "No Change." Results in this category were similar to the patterns expected from the analysis of performance data of the mildly handicapped.

One learning pattern that had not been identified in the data from mildly handicapped students showed correct responses remaining at zero, and errors higher than corrects and accelerating. The only change in strategy that was successful in improving correct performance in these three cases was to reduce the level of skill difficulty by moving to easier or prerequisite skills. These
Ten other instances of two learning patterns that both showed a rapid deceleration of correct performances to zero and high performance variability were categorized as compliance problems. In these cases, the student's previous high level of correct performance indicated that he or she could, in fact, perform the skill. The rapid deterioration of performance gave notice that somehow conditions had changed and the student no longer would perform—an instance of "won't" respond rather than "can't" respond. Such rapid deceleration of performance had not been discovered in the data from learners labeled mildly handicapped. The high performance variability associated with these patterns was also unexpected. Although only a small number of cases fell into this category (4.5% of the total usable phases), the problems involving the students who displayed such patterns were enormous. Generally, the compliance problems were evident in other instructional programs and in the classroom management of these students. Programs designed to improve compliance generally ran into difficulties because of the extensive amount of time involved in implementing successful strategies (e.g., the most successful strategy was to implement contingencies for each command throughout the school day). Because of these problems, a separate investigation of compliance problems and strategies was undertaken (Haring, White, & Liberty, Note 4, Note 5; Liberty, 1977).

The sixth and final category of learning patterns responded to a wide variety of changes—both antecedents and consequences. However, changing the level of the skill (to an easier form of the same skill, or a prerequisite skill) without changing either the antecedents or consequences was not successful in promoting progress in the instructional programs. In these cases, 12% of the total, a high probability strategy change, could not be predicted from the effects obtained.

The most important question is, of course, just how successful teachers were in selecting instructional changes that facilitated pupil progress. During the first project year, 33% of the decisions produced successful results; during the second year, 41% of the decisions resulted in improved pupil progress.

During the next year, teachers applied strategy change rules derived from project results to see if the "success rate" could be improved. In order to implement rules, the teacher collected 5 days of performance data and, looking at the level, direction of trend, and variability of the data, matched the learning pattern of the student with the patterns shown in Figure 1. Then, the "rule" advised the teacher to change (or not to change) the instructional format according to the category of the learning pattern.

These rules were used by teachers and pupils at the Gordon Haan Special Education Center of the Lake Washington School District, Washington. Six teachers and 20 severely/professionally handicapped pupils volunteered to test the rules. Data were collected as before, but rather than leaving the teachers to their own devices to determine when and how programs should be changed, special meetings were held on the average of once every 5 days to inspect pupil performance data and to discuss the application of the decision rules to those data collected on the students' individualized instructional programs.

Over the course of the year, 151 change decisions were made. Of those, in 60 cases, the pupil met the teacher's performance aim and moved to the next curriculum step. A total of 192 decisions were made based on pupils' learning patterns. Seventy-four of the patterns (39%) demonstrated acceptable progress, while 18 patterns (4%) fell into the "step back" category; 14% fell into the "change compliance" category; 14% fell into the "change for more information on how to perform" category (shown as "Antecedent Changes" in Figure 1); 42% fell into the "change to motivate fluency" category ("Consequence Changes" in Figure 1); and 26% fell into the "miscellaneous change" category.

Once the pattern of learning was categorized, teachers could choose to change or not change the instructional format as they wished. For learning patterns in the "change to provide more information" category, teachers chose to change in accord with the rule (i.e., by changing the instructional plan to provide more information to the student on how to perform a correct response), nine times and choose to disregard the rules (by changing something else or nothing at all) seven times. The power of the rule was then tested by comparing the effects of the chosen strategy on pupil performance with the effects predicted by the "rule" (i.e., success was predicted when the rule was applied; failure was predicted when the rule was ignored). Predictions proved accurate eight out of the nine times the rule was followed and five out of the seven times the rules were not followed. In short, predictions based on this "rule" were correct a total of 81% of the time.

When learning patterns indicated a problem in the category "change the contingencies or consequences," teachers chose to follow the rule 32 times and chose to ignore the rule 17 times. Predictions of the results (i.e., improved performance if the rule was followed, no improvement if the rule was ignored) proved correct in 30 of the 32 cases where the rule was followed and in 9 of the 17 cases where the rule was ignored. Overall, the "consequence change rule" successfully predicted the outcome in 79% of the cases.

As mentioned earlier, of all types of problems encountered, difficulty in the fluency-building phase of learning appeared most prevalent. The extent of that problem appears even greater, however, when one considers the eventual outcome of "successful no change patterns." According to the rules derived during the first 2 years of research, one is best to leave well enough alone when a pupil's
performance appears to be improving from day to day. Any program change implemented while the pupil is progressing is likely to disrupt that progress. In 42% of the 74 cases where pupils appeared to be getting better during the third project year, however, the prediction of continued progress proved to be wrong. In all of those cases, the pupil changed from a pattern of progress to a pattern that would indicate problems in fluency building. Thus, results suggest that many of the programs are successful only while the student is performing at a relatively low level ("acquiring" the skill). Strategies aimed at improving performance of an acquired skill (achieving mastery), when they are effective, have short-term impact. More research is needed concerning strategies that facilitate fluency building.

The final question is, of course, whether teachers who used these decision rules have a higher probability of making decisions that improve pupil performance than teachers who do not use decision rules. A total of 192 instances of decisions involving the rules were analyzed to determine the effectiveness of the rules in predicting the success (or failure) of a strategy type. A change made in accord with the rules is, in effect, a prediction that the decision will have a "successful" effect. In 109 of the 148 cases, that prediction proved to be correct; in 39 cases, the prediction was incorrect—the decision did not produce a successful effect. There were 44 decisions that were made "contrary" to the rules (e.g., changing consequences when the student's learning pattern fell into the "antecedent change" category). By extension, the rules would predict such contrary decisions to have an unsuccessful effect on performance. In 28 of the 44 cases, the decision did produce an unsuccessful effect; in 16 cases, the "contrary decision" produced a successful effect. Overall, the rules correctly predicted the effects of the decisions in 137 (71%) of the 192 decisions and incorrectly predicted the effects in 55 (29%) of the cases. So far the rules themselves seemed to hold up fairly well. The major question is, however, whether the use of data—decision rules improved the 33% and 41% "success rates" of the teachers who had not used rules in the first 2 years. During the third project year, teachers using the strategy change decision rules made decisions that improved pupil performance in 65% of the phases.

These results suggest that it is possible to discriminate a pupil's instructional needs on the basis of his or her performance during instructional programs. The learning patterns used to make these discriminations are not as simple or as clear-cut as those observed with normal or mildly handicapped pupils, but they do seem to be extensions of those rules rather than a completely different set of rules. During the final 2 project years, these rules will be refined and tested by other teachers and pupils.

**USING DECISION RULES IN THE CLASSROOM**

The decision rules can be implemented by teachers, although certain conditions are suggested if the decision rules are to be used effectively. The rules will assist in determining strategy changes in instructional programs designed to teach new behaviors or to improve performance in behaviors the student has previously acquired. Data on the use of the rules in programs designed to decelerate or eliminate behaviors are not available.

Second, the rules have the highest probability of being effective if an instructional program is planned and implemented consistently from trial to trial and from day to day. When teachers change procedures from trial to trial, or from day to day, the rules may not be effective. In addition, pupil progress under continually changing conditions is difficult to determine, perhaps because the continual shifting is "confusing" to the student. Procedures probably should be implemented for approximately 5 to 7 days or instructional sessions in order to determine their effectiveness. Conditions of planned change, as when verbal stimuli are modified for generalization training, can be treated as consistent programs. The instructional program should include a plan for antecedent events, designed to provide the cues and stimuli necessary to signal the student to begin responding, and subsequent events, designed to consequate error or correct responses.

Next, the teacher should provide a minimum of 10 opportunities for independent responding during each instructional session. The more opportunities to perform the skills, the more rapid the acquisition (e.g., Azrin, Shafer, & Wesolowski, 1976). White and Haring (1976) have suggested that a minimum of 10 opportunities to perform be given daily. For some self-help skills that minimum may include providing additional opportunities to eat, dress, and so on (Westling & Murden, 1978). If the student is just beginning to learn a response, provide the student with a very short period of time in which to respond independently, and then assist the student to respond if he or she does not respond during the period allowed. Over a period of five to seven sessions, if the response never occurs independently, the decision rules advise moving to a less difficult skill or response. If the student cannot perform a "whole" response, the program may be designed so that the student has the opportunity to perform just a small part of the behavior independently. If the student cannot perform any part of the response independently after five to seven sessions, it may be appropriate to move to a different related skill or to an easier skill level.

Another condition that will facilitate use of the rules in the classroom is the determination of an appropriate performance aim. It is necessary as well as desirable that the teacher define the standard of performance that is the program aim. Usually an accuracy criterion alone, such as 80% correct, will not be sufficient to ensure mastery (White & Haring, 1976). The pupil who can tie his shoe with 100% accuracy still may not have mastered the skill; that is, a student who takes 5 seconds to tie his or her shoe is more fluent at shoe-tying behaviors than the pupil who takes 30 minutes, although both may be 100% accurate. In fact, it is the fluency dimension of performance that has a direct impact on the pupil's environment. Since Mom may not be able to wait for 30 minutes, that pupil cannot functionally tie his shoe—Mom ties it for him instead of waiting. In
the case of shoe tying, as with many self-help skills, fluency is measured by duration, and a suitable aim for shoe tying probably would include a statement of duration. Fluency in other types of skills may be related to rate or latency. Rate is the measure that is usually most appropriate to vocational and traditional academic skills, and latency may be of highest concern in teaching compliance, conversation, question answering, labeling, and other communication skills. The performance aim should be set so that the learner will be able to perform as well as his or her nonhandicapped chronologically age-matched peers. Lower aims will ensure retarded performance (Barrett, 1979).

It is also necessary that data on pupil performance be collected and charted. It is necessary to collect information on performance in order to determine if the instructional strategies are effective. The most direct method of collecting data is usually the easiest: count the number of times the correct behavior occurs and the number of times the incorrect behavior occurs. However, this information alone does not provide sufficient information to make adequate instructional decisions (Haring et al., Note 5; White & Haring, 1976; White & Liberty, 1976). Information on the time of the responses is also necessary. Although collecting data on the rate of the response may require extra teacher effort, the advantage in making appropriate decisions is worth it. A number of sources are available that describe how to collect time-based data (Snell & Smith, 1978; White & Haring, 1976; White & Liberty, 1976).

Although some data have been collected using duration and latency measures, the rules to date are based primarily on rate data. During the project, teachers have found it necessary to adjust rate data collection procedures to fit program and instructional requirements. These data are collected by starting a stopwatch following the initial cue to respond and then stopping the watch when the pupil has completed the response or the allowable response period has expired. This method is repeated for each trial during the session. Accuracy data can be recorded for each trial, and time data can be accumulated until the end of the session. Rate per minute is then calculated by the formula: count ÷ time. In this way, the data collected reflect pupil performance only, and do not include teacher time to prepare materials, give cues, and/or administer consequences.

If data are collected during each instructional session, the student has many opportunities to "tell" the teacher, via his or her performance, about the effectiveness of the strategies. If, however, data are collected only occasionally, the information the student can provide about his or her education is limited, and it is also more difficult to determine when a particular strategy is inappropriate for that student. Data should be collected, if possible, during each instructional session.

Finally, in order to interpret more easily the information collected, data should be charted to display graphically the overall changes in performance from day to day (Snell & Smith, 1978; White & Haring, 1976). The decision rules have been designed to be used with charts that utilize a ratio-interval or semilogarithmic scale for performance on the vertical axis and an equal interval scale for time on the horizontal axis (see Teaching Exceptional Children, 1971, 3(3); White & Haring, 1976).

Once a program and data collection procedure have been implemented, teachers can make decisions by drawing learning pictures for the data approximately every 6 data days. Learning pictures can be drawn by following the steps listed below. The steps are followed once to draw a line for correct performance and once to draw a line for error performance; together with the level of performance these lines form the "learning picture."

1. Use the most recent six or seven data points. Look at the first three of those data points on the chart. Find the second highest data point. Mark a + at the intersection of the second highest point and the second data day.
2. Look at the last three data points (the three most recent). Find the second highest data point of those three points. Find the sixth day of data. Mark a + at the intersection of the points.
3. Draw a line through the two +'s, from the first point of the 6 or 7 days to the last. These steps are illustrated in Figure 2. Repeat steps 1-3 using the error plots.
4. Look at the level of performance, or the counts of corrects and errors, at the end of the 6-day period.

To determine the type of change that, according to project results, has the highest probability of accelerating pupil performance, compare the derived learning pattern with those shown in Figure 1, and change according to the category designation. Once a decision has been made, the teacher continues conducting the program, charting the data, and making decisions every 6-7 data days. An example of data and decisions is shown in Figure 3 and discussed below.

The learning picture for the data shown in the first phase of Figure 3 matches with the picture in Figure 1 for a change to provide additional information. In the first phase, the teacher said, "Give me the penny/nickel" and held it out her hand. In the second phase, this was changed to "penny/nickel," which was paired with the gestural cue of the open hand. Also in the second phase, the teacher put a penny on nickel in her own hand before giving the direction. Thus, when the student picked up the coin from the selection of objects on the table and placed it in the teacher's hand, he or she could match his or her selection with the permanent model. As the data during the second phase show, the use of antecedent changes provided sufficient information to reduce errors. The learning picture at the time of the next decision matched the "no change" category, and the teacher continued the format.

Data demonstrate that, in many respects, the learning pictures of severely handicapped students resemble those of mildly handicapped students. Learners with the label of severely handicapped respond to the same general instructional formats, which should include planned antecedent events, a precisely described target behavior, and contingent consequent events. They progress through
STRATEGIES FOR ACQUISITION PROBLEMS

Sometimes, of course, pupils will progress through both "acquisition" and "fluency building" on the strength of a well-planned instructional formula. In such cases, the designation of a stage of learning is unnecessary. When learning difficulties occur, such a designation may be used conveniently to help select strategies that facilitate pupil progress.

The stage of learning called "acquisition" in this chapter is functionally defined by the research results. Acquisition is the period of learning.

Figure 3. Example of performance data used in making decisions. Learning patterns are shown as drawn on the chart of the data.
when performance falters, changes designed to provide information to the learner about how to perform the desired response have a higher probability than other strategies of promoting pupil progress. Acquisition problems are currently identified by comparing the data collected on pupil progress in instructional programs over a 5- to 7-day period with the “Antecedent Change” patterns shown in Figure 1. If the patterns match, an acquisition problem is identified, and changes aimed at telling the learner how to respond are likely to be more successful in facilitating success than changes aimed at increasing the motivation of the learner.

Many different strategies can be used in order to inform the learner how to perform the response. Strategies can be implemented either before or after the response opportunity. If the strategy is implemented as a correction procedure, contingent upon incorrect responses, it will be faded automatically— as the learner makes fewer errors, the procedures will be eliminated. Since whatever procedure is “added” will eventually have to be faded so that conditions of responding are equivalent to those in natural environments, it may be that the correction procedure will be more efficient than providing the information as an antecedent strategy. However, data that bear on this question are not available at this time.

Directions

Directions given to the student can include, for example, verbal directions, signed directions, pictured directions, imitative directions, or gestural directions (Snell & Smith, 1978). Several types of directions may be given at once, as when a teacher says “Give me the toy” (verbal) and holds out his or her hand (gestural). Directions alone will not come to control the behavior unless they are paired with effective reinforcers (Ayllon & Azrin, 1964), but the directions do provide information to the learner about what he or she is supposed to do. Severely handicapped students may have to be taught how to follow directions (e.g., Streifel & Wetherby, 1973) before such directions can be used in instructional programs, as discussed in the section on strategies for compliance problems.

Demonstrations

In general, teacher demonstration (sometimes called modeling) has been used as a strategy contingent upon an incorrect response or a failure to respond with severely handicapped students (e.g., Horner & Keilitz, 1975; Lent & McLean, 1976; Nelson, Cone & Hanson, 1975). In those situations, the teacher demonstration is a procedure designed to provide information to the student to “correct” his or her behavior on the next opportunity to perform. Such procedures have not always proved effective with severely handicapped persons (e.g., Nelson, Cone, & Hanson, 1975). York, Williams, and Brown (1976) suggest, however, that imitation training may not only serve to teach severely/profoundly handicapped students how to imitate, but it may also teach them how to learn from a teacher demonstration. In imitation training, the teacher demonstration of the desired behavior is part of the direction (e.g., “Do this”—clap hands), while the requested behavior is one that is already in the learner’s repertoire. Thus, imitation training is designed to establish stimulus control over specific behaviors, rather than to teach new behaviors. Once the student is able to imitate, teacher demonstration may be an effective instructional strategy for new behaviors.

Litrownik, Franzini, and Turner (1976), working with trainable mentally retarded students, found that a demonstration before each trial led to better initial response than did a massed demonstration prior to any opportunity to perform. Smith and Lovitt (1975), working with learning disabled students, found that an antecedent teacher demonstration before the first opportunity to perform, when paired with a permanent model, improved arithmetic performance. Hendrickson, Roberts, and Shores (1978) compared antecedent and contingent demonstrations in teaching learning disabled children basic sight-reading vocabulary reading words. Both procedures were more effective than no demonstration, but the antecedent demonstration was more efficient than contingent demonstration, with fewer trials to criterion.

Physical Guidance

Physically guiding the learner through the behavior has been used frequently and successfully in teaching severely handicapped learners a variety of behaviors, including imitative behaviors (e.g., Streifel & Wetherby, 1973; Waxler & Yarrow, 1970; Whitman, Zakaras, & Chardos, 1971). In most cases, it has been used contingently as a correction procedure following an error response or no response. Nelson et al. (1975) found that the contingent physical guidance procedure was more effective than the contingent teacher demonstration in teaching appropriate utensil use to severely retarded subjects. Physical guidance can also be provided antecedent to the learner’s opportunity to respond. The teacher presents the materials, cues, directions, and so forth, and then guides the student through the behavior, prior to the independent response opportunity. Correction procedures may be used in conjunction with the antecedent physical assist. This procedure was sometimes used by instructional managers during the third project year. They provided an “assisted demonstration” before each opportunity to perform.

Prompts

Prompts can also be used to provide information to the learner about how to respond. Prompts can be physical, verbal, signed, or gestural, and can be given antecedent to the opportunity to respond or as part of a correction procedure. A physical prompt is usually a tap or small movement to the pupil’s hand (or appropriate body part) designed to get the response started. Verbal (signed or gestural) prompts provide information to the learner in addition to the initial directions. For example, the direction might be “Put blue with blue,” a verbal prompt might be “It’s next to the red,” and a gestural prompt might be pointing.
to the correct placement. If prompts are given antecedent to the response, the
direction and the prompt may both come to control the behavior. It may be
necessary to use a stimulus delay procedure (Streifel, Bryan, & Aikins, 1974;
Touche, 1971) in order to fade the prompt so that the verbal direction or
presentation of the materials alone becomes the stimulus for the behavior. Risley
and Reynolds (1970) found that stressing or emphasizing a key word in an
antecedent verbal direction improved verbal imitation with three disadvantaged
subjects. The emphasis served as a prompt.

Permanent Models
In addition to prompts, permanent models may show how to respond correctly.
The permanent model shows the learner the “finished product” of his or her
behavior. A permanent model for a shoe-tying program would be a completely
tied shoe. In some discrimination programs, the permanent model may be a
necessary part of the program. For example, in sorting pennies and nickels, a
penny in one section of a cash register and a nickel in another section serve as
models for the placement of the coins and cue the student which is the “penny
bin” and which is the “nickel bin.” Smith and Lovitt (1975) used teacher
demonstration plus a permanent model to teach arithmetic problems successfully
to learning disabled students. The authors were unable to locate published re-
search relating to the use of permanent models with severely handicapped stu-
dents. However, in the current study, permanent models were used antecedent
to the response in some discrimination programs.

Materials
Information can be provided to the learner by changing or rearranging the ma-
terials. In discrimination training, for example, the “correct” choice can be placed
closer to the learner than the incorrect choice (Snell & Smith, 1978), and then the
position of the materials is gradually changed to allow a more independent
choice. Gold (1972) used color coding of materials to provide information to
severely handicapped workers for the assembly of bicycle brakes. The color cues
helped the learners acquire the task faster than the cues provided by the materials
alone. Azrin, Schaeffer, and Wesolowski (1976) began teaching dressing skills to
profoundly retarded learners using clothing two sizes too large, and then gradually
reduced this to the appropriate size. Schreiber (1975) used fading procedures to change stimulus figure's in a discrimination task.

Verbal Feedback
A final contingent strategy that can provide information to the learner is praise.
The efficacy of praise has often been reported. Praise during acquisition should
be directed at the specific targeted behavior (e.g., “That’s right, blue with
blue”); “Hey, you did a great job tying your shoe”) rather than toward the
individual (“good girl”). This type of directed praise includes verbal feedback
to provide information to the learner concerning his or her performance. Verbal
feedback may also be provided contingent upon incorrect performance (“No,
you put red with blue”) but may actually increase incorrect responses (Burleigh
& Marholin, 1977). Verbal feedback may be paired with another consequence,
such as food, music, hugging, and so on.

Other Strategies
Other contingent strategies, in addition to those described above, can be used to
provide information during acquisition. Error drills have been used with learning
disabled students (Hansen & Eaton, 1978) to improve accuracy, and were used
by instructional managers during the third project year. Generally the student
is given repeated trials on those items or responses most frequently missed. Thus,
information is increased only for those responses or behaviors where it is needed.
Prompts, directions, and models can also be used antecedent to requests for
responses previously missed.

Which Strategy?
In this section several different strategies for accelerating progress when acqui-
sition problems are identified have been presented. Which strategy to choose?
Currently, performance data that might help in the selection of a particular
strategy are not available. In fact, it is likely that such data would be very
difficult to collect, since it is probable that the success or failure of a particular
strategy when implemented with a particular pupil is dependent on several dif-
ferent characteristics. In addition to the particular learning pattern, the type of
behavior being taught may also be important. For example, permanent models
may be more effective with self-help skills than with preacademic skills, while
physical guidance works best in self-help skills. These types of questions may
be empirically answered by future research. Another probable factor is, of course,
individuality of performance of both pupil and teacher. One pupil may respond
better to gestural cues while another responds better to physical guidance. If
the teacher does not feel comfortable using a particular strategy, the implemen-
tation of that strategy may not accelerate responding. These questions may be
answered by empirical data; until they are, however, the decision rules will help
in identifying generic areas for change, but rules to help select a specific strategy
are not available.

Teachers may then consider other reasons in the selection of strategies.
Since behavior change is directed at preparing students to participate in com-
munity and home activities, any “help” required for that student beyond that
which can be normally found or provided in community settings will have to be eli-
ninated before full mastery of the behavior can be achieved (Brown, Niewaki, &
Hammer-Nietupski, 1976). For example, students must be able to demonstrate
shoe tying without permanent models in order to perform comparably to their
age peers, or to be able to tie shoes at the bowling alley. Thus, if such models are
used, they must eventually be removed. More subtly, verbal cues and other non-natural stimuli must be faded from the instructional setting. Since verbal cues like “Take a bite” are not routinely provided in restaurants, the severely handicapped individual should be taught to respond appropriately in the absence of such cues. How can this be done? Acquisition may be quicker if instruction is provided in an environment as nearly like community and home environments as possible, using natural materials, stimuli, and consequences. Then, if the learner falls, information can be added and then faded when the student can perform the response. Another method would be to provide as much information initially as might be required to facilitate acquisition and then fade it out. Research may identify which of these methods is the most effective in accelerating learning; currently, however, the individual classroom teacher must choose.

STRAATEGIES FOR FLUENCY-BUILDING PROBLEMS

Fluency building is that stage of learning in which changes designed to motivate fluent and efficient performance are most likely to accelerate faltering progress. Increasing efficiency may involve increasing the rate of the behavior, increasing or decreasing the duration of the behavior, or decreasing the latency of responding. Much research has emphasized increasing rate of performance, especially with regard to performance on vocational tasks (Bellamy, Inman, & Schwarz, 1978). Chaffin (1969) reports that production rate is a significant variable in the failure of retarded adolescents in job placements. Barrett (1979) discusses the importance of performance rates in relationship to the goal of community integration and normalization. O’Brien, Azrin, and Bugle (1972) designed a program to increase the duration of walking, while other programs have been designed to decrease the duration of various self-help skills, such as shoe tying (Westling & Murden, 1978). Stimulus-delay procedures are designed to reduce the latency with which the student responds to a stimulus. In each case, the particular time component is a measure of the fluency with which the subject can use the acquired skill. A subject who can correctly name a picture within 1 second (latency) is more “fluent” with that label than a student who needs 10-15 seconds to name the picture correctly. Similarly, a student who can sort at a rate of 30 objects per minute is more fluent with the skills needed for sorting than a student who sorts at a rate of 10 objects per minute, although both may be 100% accurate.

An instructional format, which includes opportunities for practice and consequences for correct and incorrect responses, may prove powerful enough to move the student from acquisition to a specified fluency criterion. When learning falters, however, changes must be made.

Fluency-building problems were identified in the learning patterns of mildly handicapped students as generally beginning at approximately 20 correct responses per minute, with errors at 10 per minute or less, and with correct responses either flat or decelerating (White & Haring, 1976). Data collected on mildly handicapped students generally reflected performance in academic tasks, such as reading and math, as probed during 1-minute performance samples. In many of the severely and profoundly handicapped subjects of this research, those same performance patterns have been identified with fluency-building problems. However, in many cases the fluency-building problems occurred at lower performance rates. The “Consequence Change” patterns shown in Figure 1 include those identified as fluency-building problems during the third project year. The learning patterns that were identified as “fluency-building problems” responded to changes in the instructional format which emphasized the provision of additional practice and/or changes in consequences designed to motivate fluent performance.

Drill and Practice

The traditional method of improving performance is drill and practice in the behavior (e.g., Smith, 1968). However, much of the research in this area has been conducted with mildly handicapped students on paired-associate tasks. O’Brien, Azrin, and Bugle (1972) increased the amount of practice for walking by restraining an alternative behavior, crawling, and increased “locomotion time” spent walking. Mayhall and Jenkins (1977) compared the effects of daily and less-than-daily sessions on the performance of learning disabled children: daily instruction with the associated increase in practice produced superior performances. In general, increases in the amount of practice may result in increases in rate, if appropriate contingencies are available. However, research with severely handicapped persons has not compared the effects of different types or amounts of practice on performance.

Instructions

The most direct tactic aimed at increasing fluency would be to tell the learner to “go fast” (e.g., Loos & Tizard, 1955) or to give the learner specific performance goals (e.g., Zimmerman, Overpeck, Eisenberg, & Garlick, 1969). Instructions may initiate behavior change (Ayllon & Azrin, 1964; Hopkins, 1968), although they may not be sufficient to sustain or further accelerate behavior change. Instructions are probably the most “natural” way of increasing behavior, but they may not be the most effective over the long run. In the results to date, instructions have produced an increase in level of performance when first introduced but have not resulted in continued acceleration of fluent performance.

Manipulation of Consequences

Consequences for correct and/or fluent performance, as well as for incorrect and/or disfluent performance, are a necessary part of every instructional format. When progress falters during a fluency-building phase, however, manipulating the consequences is far more likely to produce progress than the manipulation of antecedents. The pupil does not need more information on how to perform, but reinforcement to continue improving performance on a skill that is probably being practiced over and over again. Although researchers have used a variety of
consequences for correct behavior with severely handicapped learners, including food, juice, music, hugs, and vibrators (Bailey & Meyerson, 1969; Bellamy, Inman, & Schwarz, 1978; Snell & Smith, 1978), in most cases paired with verbal or signed praise, it is often difficult to identify potential reinforcers for a specific severely/profoundly handicapped student (Spradlin & Spradlin, 1976). Some authors have suggested “reinforcer” surveys to identify consequences for correct responses (e.g., Snell & Smith, 1978; Williams & York, 1978). From observation of the student, and through presentation of a variety of edibles, toys, and other possible consequences, the manager ‘decides’ what the student “likes” and then uses the consequence contingently during an instructional program. However, these are not very precise methods, and a consequence that the subject may “choose” in one situation may not be effective in increasing his or her behavior in another situation (Haring et al., Note 4); if it is not effective, it is not a reinforcer.

Generally, merely changing from one type of contingency to another will produce only short term effects on performance (Haring et al., Note 5) and perhaps with less dramatic effects than when the consequence change is accompanied by verbal instructions as to the contingencies (Herman & Tramontana, 1971; Van Houten, Hill, & Parsons, 1975).

Once an appropriate consequence has been identified, its delivery is usually made contingent upon the desired response. When the pupil is first learning to perform, consequences are usually delivered for each accurate performance of the desired response. During fluency building and after fluency has been achieved, this “one-to-one” schedule may not be effective for all programs. Programs designed to increase rate, for example, as the rate increases, the number of consequences increases. The learner may become satiated and that consequence may lose its effectiveness. In addition, the consequences scheduled for the instructional environment may not be natural to the community environment in which the behavior will be ultimately performed.

To avoid the possible effects of satiation, to increase the naturalness of the setting, and to build fluency, intermittent schedules may be implemented. Stephens, Pear, Wray, and Jackson (1977) found that, while accuracy remained high throughout, rate of naming pictures for severely handicapped subjects was higher under intermittent fixed-ratio schedules than under one-to-one schedules. In the same article, the authors report another study in which they compared low and high fixed-ratio schedules, and found that intermediate schedules produced the highest rates. Schroeder (1972), in a series of studies, concluded that ratio rather than interval schedules might produce higher rates on simple tasks, although a very high ratio may not produce as large an increase as a lower ratio on difficult tasks.

Another method of changing the schedule is to make the consequences contingent upon a certain response rate (Haring et al., Note 5; Zimmerman, Overpeck, Eisenberg, & Garlick, 1969; Zimmerman, Stuckey, Garlick, & Miller, 1969). However, unless the desire performance increases from day to day (or decreases if that is desired), in a “changing criterion” design, the learner may perform only at the level sufficient to receive the contingency (Hartmann & Hall, 1976). Performance parameters that can be manipulated include rate, duration, and latency. In establishing a “changing criterion” for rate of response, either the required number of responses in a set period of time can be increased, or the amount of time for a set number of responses may be decreased. Ayllon, Garber, and Pisar (1976) found that gradually reducing time limits for task completion from 20 to 15 to 10 and finally to 5 minutes was extremely effective in increasing performance rate for moderately retarded students, while an abrupt decrease in the time limit interfered with task rate. Reducing the time limit for completing a correct response, or a number of correct responses, and then making reinforcement contingent upon that desired performance was effective in increasing severely handicapped subjects’ rate on a variety of tasks (Haring et al., Note 5).

Another method of increasing fluency is to provide contingent punishing consequences for low work rates (Zimmerman, Overpeck, Eisenberg, & Garlick, 1969). Such contingent punishing consequences may include time-out from the opportunity to work, or loss of the consequence (e.g., tokens) previously earned for high work rates (response cost). Haring et al. (Note 5) found that having students repeat performances until daily criteria were met resulted in an increase in performance rate. It was not clear whether this increase in rate was due to the extra practice that occurred when the students’ performance was low or due to an avoidance response to the repeated practice trials that were contingent on low rates.

Other Strategies

Haughton (Note 6) has suggested that rearranging the instructional environment to allow the student greater opportunity to perform a task may affect the development of fluency. For example, rather than teacher presentation of each item in a “match-to-sample” format, the learner could be given a large number of items to sort independent of any teacher presentation of material. Carmine (1976) found that when teacher presentation of items is necessary, a fast-rate teacher presentation resulted in reduced latency of responding to two first graders when compared to a low-rate presentation of items. Van Houten and Thompson (1976) found that an explicit timing of math performance increased rates of performance in second graders, in comparison with implicit (secret) timings. The accuracy of performance was maintained during the implicit and explicit timings. Van Houten, Hill, and Parsons (1975) found that public posting of performance rates increased performances, while teacher praise for performance had mixed effects. Arranging for work with a more competent peer may also increase work rate through the effect of demonstration (Brown & Pearce, 1972). Although these studies did not involve severely/profoundly handicapped students, the procedures and techniques may have implications for them.

Haring et al. (Note 5) used a “beat the clock” technique to increase rate of performance with severely handicapped subjects. This technique combines a...
verbal direction ("Go fast, beat the clock"), a statement of the contingencies ("If you beat the clock, you may have this prize"), a set amount of time to complete the task (the clock is set at the amount of time), a daily increasing number of required responses to earn the consequence, feedback on performance ("Oh! The clock went off and you've finished all of your work!") and a consequence (prize).

**Which Strategy?**

Which strategy should a classroom teacher choose when a pupil's performance falters during the fluency-building stage of learning? Just as with acquisition problems, it is unlikely that decision rules based on performance patterns will help decide this issue, especially since the reinforcing impact of any consequence is dependent upon the individual pupil. Classroom teachers may be able to decide intuitively between nuts or juice based on their history with a particular behavior; such a choice is currently beyond the decision rules. The classroom teacher may also want to consider such issues as the schedule and type of consequences available in natural environments in selecting strategies during fluency building.

**MISCELLANEOUS PROBLEMS WITH INSTRUCTIONAL FORMATS**

Learning patterns that fall into the "miscellaneous" category are puzzling, because it seems that the manipulation of consequences has equal probability of improving learning. In most cases where such patterns have been identified, the instructional format provided by the classroom teacher is generally lacking some basic provisions. The most common mistake seems to be providing identical consequences for both correct responses and incorrect responses. In one common problem case, for example, if the student responds correctly, he or she is praised, while if the student responds incorrectly he or she is assisted to respond and then praised. If pupil performance patterns fall into this category, the teacher should reexamine the instructional format. For some basic considerations of instructional formats, the reader is referred to Exceptional Teaching (White & Haring, 1976).

**INCORRECT SKILL STEP**

One of the most frequently used change strategies is to reduce the level of difficulty of the program, usually by requiring an easier version of the skill level or a prerequisite skill. The data available suggest, however, that "stepping back" to an easier version of the skill has the highest probability of being effective in only one given situation (see Figure 1). If such a decision is made in other cases, it not only has a low probability of improving performance, but it may also serve to delay curricular progress and prolong instructional time. The use of the data-based decision rules promotes the modification of instructional settings to facilitate individualized progress, rather than the modification of what is being taught.

**STRATEGIES FOR "COMPLIANCE" PROBLEMS**

The term *compliance* has become almost a catchword recently. It is typically associated with "minding" behavior. Does the student do what you ask? It has also been referred to as "instruction-following behavior," but instructions with a difference—instructions that classroom teachers *expect* the student to obey. It is known that the pupil is able to respond, and the instruction is given with the expectation that it will be followed. When the student does not follow the instruction, problems occur.

The three general types of problems involve classroom management, skill assessment, and instructional decisions. Often, directions are used to help move students and materials from place to place or from activity to activity. Instructions that might be used to help manage the classroom include: "Pick up your coat," "Come here," "Stand up," "Go to the sink," "Get in line," and so forth. Students who do not obey these instructions may cause problems in general classroom management. Directions and instructions are also used to help determine the appropriate level at which to begin instruction. Initial assessment is used to determine what skills the student already can perform and what skills the student needs to learn. Students are expected to "try" to follow instructions in such situations. A student who does not attempt to follow instructions presents the problem of determining whether he or she can actually do the requested behavior but won't or whether he or she really can't follow a particular instruction. If he or she cannot respond, the student needs to be taught. If he or she will not respond, the teacher has a compliance problem. But what is it? This problem very often results in placing the student at an instructional level that is too easy. The student may then become bored and display disruptive behaviors, which lead to more problems. Finally, instructions are generally used in teaching new behaviors and skills. For example, in teaching a student to discriminate between a quarter and a penny, the cue might be, "Point to the quarter." If the student does not point to one of the choices, the teacher is faced with the dilemma of whether or not the student just "won't" point, or whether he or she can't choose the correct answer and so just doesn't respond at all. Should the teacher provide more information to help the student learn the discrimination, or should he or she try to improve instruction-following behavior? Which decision should it be?

These three problems may be compounded if instructions are used to "get rid" of various behaviors. Such commands represent a special case of "instruction following.

**Using Instructions to Eliminate or Decrease Behavior**

Some of the most common instructions we use are those that tell the student not to do something (e.g., "Don't lie," "Don't do that"). Generally, such instructions are used to control behavior that is considered inappropriate for some reason. Sometimes such directions are effective, but, more often, they serve only to increase the behavior at which they are aimed, which makes matters worse (Burleigh & Marblion, 1977).
A criticism-trap can develop whereby the teacher's direction serves to reinforce the student for the inappropriate behavior, and, if the student obeys the instruction, the teacher is reinforced for giving the direction, as in this sequence:

Jim gets out of his seat.
Mr. Smith says, "Go back to your seat."
Jim goes back to his seat.

Jim was successful in attracting the teacher's attention (by getting out of his seat) and was probably reinforced by the "admonition." Mr. Smith, on the other hand, was reinforced for giving the instruction by the fact that Jim did go back to his seat. In the future, whenever Jim wants to get Mr. Smith's attention, he can get out of his seat. Mr. Smith can probably avoid this entire problem by giving Jim attention for staying in his seat and doing his schoolwork, rather than attention for getting out of his seat. In this case, misplaced consequences create a trap that can go on and on. In general, it is best to conduce the inappropriate behavior in some other fashion, (e.g., by ignoring Jim and praising Steve for staying in his seat) and continue to provide consequences for the desired behaviors. Using commands to eliminate or decrease behavior may be effective in the short run but usually has the opposite effect in the long run; as a result, such commands are not usually considered to be in the same class as the commands involved in compliance.

Commands included in "instruction following" are those that, in general, ask the student to perform some action (rather than request the student to stop some action) and that are NOT given in response to some inappropriate behavior by the student.

Acquisition of Instruction-Following Behavior
There are two general paths in learning to follow instructions. In one, the instruction is learned at the same time as the behavior. In the other, the instruction is learned after the behavior has been learned.

Teachers do not give commands and expect them to be followed if the pupil cannot perform the required action; instead, the pupil is provided instruction in that behavior. If the student cannot stand, compliance to the instruction "Stand up" is not expected. If the learner is being taught to stay, however, the words "Stand up" may be used as part of the signal to the behavior. As the pupil learns the response, he or she would also learn to associate the signal "Stand up" with the behavior. So, if the pupil is acquiring a behavior, he or she is also learning which set of words, cues, objects, or stimuli signal the performance of the behavior. The student is acquiring the "instruction" at the same time he or she is acquiring the behavior.

In other instances, the behavior is acquired long before the instruction. For example, children may learn to look at adults before they learn to respond to "Look at me." In this case, the "acquisition of instruction following" is simply learning to associate a particular set of words (or other stimuli) with a previously learned behavior.

Whichever the case, learning to follow instructions requires that the pupil learn a discrimination: a particular response (as opposed to another) should follow a particular direction (and not another). This discrimination is learned like any other discrimination, by associating the consequences of a behavior with that response. Consequences for following directions must be different from the consequences for not following the direction. The difference in consequence teaches the student the discrimination.

Generally, a reinforcing consequence must be determined and given following the correct behavior only. The incorrect behavior, either not responding at all to an instruction or responding with some other behavior, should be ignored or followed by some consequence that the student does not "like." Beware of "helping" the student finish the response and then praising him or her for "trying to do it" or for anything else. If the student "likes" being helped, and "likes" being praised, chances are that he or she will "do it wrong" again just so he or she will be helped and praised. Unless there is a difference in consequences, the student may not be able to discriminate what it is he or she is supposed to do in response to your instructions.

The acquisition of instruction-following behavior continues until the student consistently obeys the instruction. Then, consequence is usually reduced to the more natural intermittent schedule. The command-response pairs acquired by the student become the pool for the determination of noncompliance.

Consistency and Compliance
The collection of command-response pairs that has been acquired by the student serves as a compliance "pool." When the student is asked to perform a behavior from his or her pool, it is expected that the student will obey. Compliance 100% of the time is not expected, however. In fact, kindergarteners are compliant roughly 85% of the time (Pitt, Sadler, and Vickers, Note 7).

The key word here is expect. In order for us to come to expect, or predict, an event, that event must occur "predictably." A great deal of variability will prevent us from making a good prediction. If a student has scored 75%, 80%, 78%, 79%, and 82% on spelling tests in the past, a reasonable prediction or expectation concerning his or her performance on the next test is between 79% and 85%. However, if a student has scored 10%, 95%, 50%, 25%, and 85% on previous tests, it will be difficult to predict the next test score. The compliant student is not only one who will obey but one who will do so consistently, day after day. The consistency of compliance is just as important as the level of compliance.

Noncompliance Noncompliance is "not minding" and "not following instructions," carried out consistently. There are two general ways of being noncompliant: either by not responding to the command at all, or by performing some other, nonrequested, behavior. Noncompliant students usually "don't respond" to commands, as opposed to responding by "doing something else."

There are times when some noncompliant students choose to "do some-
thing.” rather than to “do nothing.” Usually this is in an instructional choice situation. In any choice situation (e.g., matching, sorting), there exists the possibility of getting the correct answer by chance, if responses are random. Thus, we will expect the student who is trying to match prices with advertisements from a choice of five to occasionally succeed just by luck (approximately once every five trials). As the skill is acquired, performance will, of course, improve above chance levels. The noncompliant student, on the other hand, may consistently respond incorrectly, never matching the price to the ad. In choice situations, noncompliant students may consistently—and suspiciously—do the “wrong” thing.

Since noncompliance is based on not following instructions from the command-response pool, the noncompliant student is generally noncompliant throughout the school day. If noncompliance only occurs during particular situations, it may not be a compliance problem.

**Identifying Noncompliance** Noncompliance can only occur if both of the following conditions are met:

1. The student is able to perform the behavior.
2. The student has previously performed the behavior in response to the instruction given.

Thus, the two most important aspects in the determination of noncompliance are the behavior and the command. The behavior must be something in the student’s response repertoire. He or she must be able to perform the behavior, and, generally, the performance of the behavior should have been observed in the situation in which the command is given.

The command must have elicited the desired response in the past. Thus, the student must know or understand what is being requested. Generally, an appropriate response to the specific command should have been observed in the situation in which the command is to be given.

The following examples illustrate some of the problems in determining noncompliance:

1. Cherie has cerebral palsy as well as several other handicapping conditions. She is usually either in her wheelchair or on a floor mat. She is unable to stand up. Cherie failed to stand up in response to a “Stand up” command. This is NOT an instance of noncompliance; since Cherie is unable to perform the behavior.
2. John is able to walk and to stand up. John has responded to the command “Come here” in the past. He failed to respond appropriately to the direction “Go to the sink.” This is NOT an instance of noncompliance, because it is not known if John understands the command “Go to the sink.”
3. Later in the day, however, John is asked to “Come here.” He does not respond. This is probably an instance of noncompliance.
4. Mark’s mother reported that Mark will say “mum” at home. To get him to do it she closes her lips and says “mum.” One day at school, Mark’s teacher asks him to say “mum,” using the same command that his mother uses. Mark does not respond. This is NOT an instance of noncompliance, since Mark’s correct response to this instruction has not been observed at school.

**Noncompliance in Instructional Programs** Noncompliance in instructional programs is difficult to determine because, during instructional programs, the failure of the student to respond correctly may be either an indication of noncompliance or an indication of “not knowing” what to do. Noncompliance during an instructional program can usually be distinguished from “not knowing” according to various performance characteristics (see also Figure 1).

Probable the most common indicator of compliance problems is variability in correct performance, the opposite of the predictability common to compliant students. Day-to-day performance of noncompliant students can vary greatly, from 20 correct per minute on one day to 0 correct on the next. Performance variability itself becomes a pattern; one extreme day does not by itself constitute a problem with variability. Noncompliant students often will exhibit performance variability from day to day that is greater than the change over time.

The lack of variability in certain situations may also be an indicator of compliance problems. In programs that require a discrimination, a certain level of corrects and of errors can be determined by chance. If the corrects are consistently below chance levels, determine if there is a “preference” for one position over another (the student always picks the object on the left, for example) or for one object over another (e.g., the student always picks the cup). This can be determined by collecting and analyzing data on each trial, while varying choice commands and positions. If there is not a preference problem, and corrects are consistently below chance levels, the student may be noncompliant.

Another indicator of compliance problems is a decrease in correct performance from a relatively high level to a very low level. Compliance problems may occur at any performance level in a program. However, if performance is at 100% but not at the fluency aim (e.g., 60 per minute), the problem may be a fluency-building problem, which may produce similar changes in level.

These performance characteristics may help understand and identify compliance problems when they occur during instructional programs. Although compliance or noncompliance is not completely understood at this time, there are some program changes that have been effective in correcting these problems. In general, however, compliance problems during instructional programs can be remediated only for a relatively short period of time.

**Move to a More Difficult Skill Level** It is often very difficult to determine appropriate instructional levels for noncompliant students. As a result, instruction is sometimes begun at levels that are “too easy.” Students consistently required to do work that is too easy may exhibit noncompliant behaviors or seem “bored.” This may be especially true when noncompliance is seen during a
specific program rather than throughout the school day. If the behavior is very important, and is one that it is critical the student learn to perform consistently at high levels, then it will be necessary to select another strategy. If, however, the skill is at an intermediate level, or is one in a task hierarchy, it may be most expedient to move to a more difficult skill level. It may be necessary to move several times in order to determine an appropriate level.

Students may also exhibit noncompliant behavior when criteria for moving on require consistent performance for 3 or more days (e.g., 100% for 4 consecutive days as a criterion for moving to the next task step). Teachers should examine criteria carefully: Is it really necessary to require 100% for several consecutive days, or does this delay the student? Are such criteria based on previous data, or are they merely a “best guess” about ending levels? Sometimes it may be unnecessary to require a student to remain at criterion for several days, particularly when the specific skill will be used or incorporated in the next step, or when the step is just one small part of a behavior sequence.

Change or Add a Motivating Consequence for Correct Performance. Noncompliance is probably the result of a breakdown in stimulus control, which in turn is the result of a failure of the consequences to control the behavior. The most easily implemented change is to add or change the “motivating” consequence for the correct behavior.

Change the Schedule for Consequences of Correct Responses. Another method of reestablishing stimulus control is to continue using the same consequence but on a “leaner” schedule. For example, if the consequence has been available for every correct response, it could be made available only following two correct responses.

Institute a Response-Cost Procedure. In the response-cost procedure, the student gains something for correct responses and loses it for incorrect responses. For example, the student may be praised and given a raisin for each correct response. If the student is prevented from eating the raisin he or she earns until the end of the session, it is then possible to remove the raisin for each incorrect response. Of course, the student can then go into the “hole” and lose raisins that have not been earned. It is generally better to avoid this deficit situation, and to remove consequences only after they have been actually rewarded. If possible, the student should be told that the contingency is in effect at the beginning of each instructional session.

Eliminate Competing Consequences. Often, other consequences not immediately discernible may be affecting performance on the program. If, for example, the student is expected to perform for a limited number of trials, or for a limited amount of time, the student may simply be “waiting it out.” In this case, either being “released” from the program or having “free time” may be reinforcing the noncompliance. Or, if recess follows the program, or lunch, or something equally as exciting, the Premack principle may be working against compliance.

Such competing consequences can be used by making them contingent upon correct performance. The contingency can involve increasing the number of correct responses or consecutive correct responses required before the termination of the program, for example. In this case, the student would be required to score one correct on the first day, two correct on the second, three correct on the third, and so on. The instructional session would continue until the aim for that day was reached. The student would be informed of the contingency prior to the instructional session.

Sometimes the competing consequence is simply teacher proximity. Data show that students in wheelchairs often will perform noncompliantly simply to increase the session time and consequently the amount of time in which the teacher is present, even if the consequences for noncompliance are painful (Haring et al., Note 5). In these cases, the time-out procedures can be implemented. For example, if the student has not responded within 5 seconds, the manager would leave the setting, returning only when the correct response had been performed.

In other cases, the availability of “chance corrects” may reinforce noncompliance. The student who consistently goes to the left position may be consequated for doing so if the left position is occasionally the correct position. The other extreme is the student who makes persistent errors beyond chance levels. In these cases, establish an order of trials that prevents such consequence. For example, in a sorting program, the student may “never” sort items of a particular shape. In such cases, a type of “repeat for error” drill might be effective. Each time the student made an error, that stimulus condition would be repeated until a correct response was obtained. This procedure permits the student to receive the consequence for correct responses only when all types of correct responses are performed. The “repeat for error” procedure may be coupled with an “increasing aim,” as described above.

Other Consequences. Aversive contingencies that may be used as a “last resort” include: ignoring the pupil and removing any materials; removing the student from the instructional session for a short period (or leaving the student alone); and a forceful putting through procedure, or mandate. These consequences would immediately follow any noncompliant response and would not be accompanied by any other feedback, especially a verbal reprimand. Since aversive contingencies may result in harmful side effects, they should be used only in extreme conditions, and only after obtaining parent and school approval, as required. Aversive consequences should only be continued if they demonstrate their effectiveness quickly, and they should be removed as soon as possible.

GENERALIZATION AND ADAPTATION

The strategies presented are those that can be used to facilitate pupil progress through two functionally defined stages of learning: acquisition and fluency building. But what of the learning stages beyond: generalization and adaptation?
Generalization may be said to occur when a learned response is observed to occur in the presence of “untaught” stimuli. Adaptation is said to occur when the topology of a learned response changes in the presence of “untaught” stimuli. What are the environmental conditions that will facilitate generalization and adaptation?

Stokes and Baer (1977) summarized various tactics that have been reported as facilitating generalization. The fact that generalization is not always observed, however, suggests the necessity of developing “a technology of generalization, so that programming will be a fundamental component of any procedures when durability and generalization of behavior change are desirable” (Stokes & Baer, 1977, p. 365). Research can identify exactly what programming procedures are particularly effective with severely/profoundly handicapped persons and how they can be implemented by teachers in classrooms. Perhaps, with sufficient training, severely/profoundly handicapped students can “learn how to generalize,” and programming for generalization would not be necessary.

In adaptation training, the student would learn how to modify behaviors to meet the requirements of new situations. For example, if one teaches a student to walk over smooth surfaces, will the pupil be able to adapt his or her walking movements to walk successfully over rough ground without further instruction? That is one step beyond generalization—changing the topology of the response to meet the novel response requirements of the new setting. Adaptation is also a crucial issue in regard to severely/profoundly handicapped persons, since it is certainly impossible to teach students every variation of every behavior/skill necessary to meet the changing requirements of different environments. Essentially, adaptation amounts to problem solving. Guralnick (1976) suggests that to solve problems direct training in the use of effective problem-solving strategies be given, that such strategies may involve cognitive self-guidance, and that they focus attention on the distinctive features of the problem. Guralnick used self-reinforcement, teacher demonstration, verbal directions, verbal mediation (having the subject repeat the directions aloud), and verbal feedback in teaching moderately retarded subjects to solve complex perceptual discrimination problems. Can those procedures be used effectively with severely handicapped students? What skills are prerequisite to problem solving? Until these questions are answered, the behavioral repertoire of severely handicapped students may remain severely limited.

Obviously a great deal of research remains to be done in order to determine effective instructional plans for severely/profoundly handicapped learners. Much of the research to date has not only concentrated on less handicapped individuals, but has also failed to show the appropriateness of various instructional strategies to the total continuum of skill development. The current research shows promise in achieving this discrimination and provides a method, through the use of decision rules, for the appropriate application of strategies to meet the learning needs of individual pupils.

REFERENCES


Baldwin, V. Curriculum concerns, In M. Angele Thomas (ed.), Hey, don’t forget about me. Reston, Virginia: Council for Exceptional Children, 1976.


Chaffin, J. D. Production rate as a variable in the job success or failure of educable mentally retarded adolescents. Exceptional Children, 1969, 35, 533–538.

Duncan, A. Precision teaching in perspective: An interview with Ogden R. Lindsley. Teaching Exceptional Children, 1971, 3(3), 114–120.


Guralnick, M. J. Solving complex perceptual discrimination problems: Techniques for the


REFERENCE NOTES


Section III

EVALUATION OF OUTCOME: CURRENT RESEARCH