PART 12

Promoting Generalized Behavior Change

Socially important behavior can be changed deliberately. The preceding chapters describe basic principles of behavior and how practitioners can use behavior change tactics derived from those principles to increase appropriate behaviors, achieve desired stimulus controls, teach new behaviors, and decrease problem behaviors. Although achieving initial behavior changes often requires procedures that are intrusive or costly, or for a variety of other reasons cannot or should not be continued indefinitely, it is almost always important that the newly wrought behavior changes continue. Similarly, in many instances the intervention needed to produce new patterns of responding cannot be implemented in all of the environments in which the new behavior would benefit the learner. Nor is it possible in certain skill areas to teach directly all of the specific forms of the target behavior the learner may need. Practitioners face no more challenging or important task than that of designing, implementing, and evaluating interventions that produce behavior changes that continue after the intervention is terminated, appear in relevant settings and stimulus situations other than those in which the intervention was conducted, and/or spread to other related behaviors that were not taught directly. Chapter 28 defines the major types of generalized behavior change and describes the strategies and tactics applied behavior analysts use to achieve them.

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CHAPTER 28

Generalization and Maintenance of Behavior Change

Key Terms

behavior trap
contrived contingency
contrived mediating stimulus
general case analysis
generalization
generalization across subjects
generalization probe
generalization setting
indiscriminable contingency
instructional setting
lag reinforcement schedule
multiple exemplar training
naturally existing contingency
programming common stimuli
response generalization
response maintenance
setting/situation generalization
teaching sufficient examples
teaching loosely

Behavior Analyst Certification Board® BCBA® & BCABA® Behavior Analyst Task List©, Third Edition

Content Area 3: Principles, Processes, and Concepts	
3-12	Define and provide examples of generalization and discrimination.
9-28	Use behavior change procedures to promote stimulus and response generalization.
9-29	Use behavior change procedures to promote maintenance.

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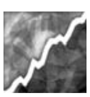
> Sherry's teacher implemented an intervention that helped Sherry to complete each part of multiple-part, in-school assignments before submitting them and beginning another activity. Now, three weeks after the program ended, most of the work Sherry submits as "finished" is incomplete and her stick-with-a-task-until-it's-finished behavior is as poor as it was before the intervention began.

> Ricardo has just begun his first competitive job working as a copy machine operator in a downtown business office. In spite of his long history of distractibility and poor endurance, Ricardo had learned to work independently for several hours at a time in the copy room at the vocational training center. His employer, however, is complaining that Ricardo frequently stops working after a few minutes to seek attention from others. Ricardo may soon lose his job.

> Brian is a 10-year-old boy diagnosed with autism. In an effort to meet an objective on his individualized education program that targets functional language and communication skills, Brian's teacher taught him to say, "Hello, how are you?" as a greeting. Now, whenever Brian meets anyone, he invariably responds with, "Hello, how are you?" Brian's parents are concerned that their son's language seems stilted and parrot-like.



Each of these three situations illustrates a common type of teaching failure insofar as the most socially significant behavior changes are those that last over time, are used by the learner in all relevant settings and situations, and are accompanied by changes in other relevant responses. The student who learns to count money and make change in the classroom today must be able to count and make change at the convenience store tomorrow and at the supermarket next month. The beginning writer who has been taught to write a few good sentences in school must be able to write many more meaningful sentences when writing notes or letters to family or friends. To perform below this standard is more than just regrettable; it is a clear indication that the initial instruction was not entirely successful.

In the first scenario, the mere passage of time resulted in Sherry losing her ability to complete assignments. A change of scenery threw Ricardo off his game; the excellent work habits he had acquired at the vocational training center disappeared completely when he arrived at the community job site. Although Brian used his new greeting skill, its restricted form was not serving him well in the real world. In a very real sense, the instruction they received failed all three of these people.

Applied behavior analysts face no more challenging or important task than that of designing, implementing, and evaluating interventions that produce generalized outcomes. This chapter defines the major types of generalized behavior change and describes the strategies and tactics researchers and practitioners use most often to promote them.

Generalized Behavior Change: Definitions and Key Concepts

When Baer, Wolf, and Risley (1968) described the emerging field of applied behavior analysis, they included *generality of behavior change* as one of the discipline's seven defining characteristics.

> A behavior change may be said to have generality if it proves durable over time, if it appears in a wide variety of possible environments, or if it spreads to a wide variety of related behaviors. (p. 96)

In their seminal review paper, "An Implicit Technology of Generalization," Stokes and Baer (1977) also stressed those three facets of generalized behavior change—across time, settings, and behaviors—when they defined *generalization* as

> the occurrence of relevant behavior under different, non-training conditions (i.e., across subjects, settings, people, behaviors, and/or time) without the scheduling of the same events in those conditions. Thus, generalization may be claimed when no extratraining manipulations are needed for extratraining changes; or may be claimed when some extra manipulations are necessary, but their cost is clearly less than that of the direct intervention. Generalization will not be claimed when similar events are necessary for similar effects across conditions. (p. 350)

Stokes and Baer's pragmatic orientation toward generalized behavior change has proven useful for applied behavior analysis. They stated simply that if a trained behavior occurs at other times or in other places without it having to be retrained completely at those times or in those places, or if functionally related behaviors occur that were not taught directly, then generalized behavior change has occurred. The following sections provide definitions and examples of the three basic forms of generalized behavior change: response maintenance, setting/situation generalization, and response generalization. Box 28.1, "Perspectives on the Sometimes Confusing and Misleading Terminology of Generalization," discusses the many and varied terms applied behavior analysts use to describe these outcomes.

Response Maintenance

Response maintenance refers to the extent to which a learner continues to perform the target behavior after a portion or all of the intervention responsible for the

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Box 28.1
Perspectives on the Sometimes Confusing and Misleading Terminology of Generalization

Applied behavior analysts have used many terms to describe behavior changes that appear as adjuncts or byproducts of direct intervention. Unfortunately, the overlapping and multiple meanings of some terms can lead to confusion and misunderstanding. For example, *maintenance,* the most frequently used term for behavior changes that persist after an intervention has been withdrawn or terminated, is also the most common name for a condition in which treatment has been discontinued or partially withdrawn. Applied behavior analysts should distinguish between *response maintenance* as a measure of behavior (i.e., a dependent variable) and *maintenance* as the name for an environmental condition (i.e., an independent variable). Other terms found in the behavior analysis literature for continued responding after programmed contingencies are no longer in effect include *durability, behavioral persistence,* and (incorrectly) *resistance to extinction.**

Terms used in the applied behavior analysis literature for behavior changes that occur in nontraining settings or stimulus conditions include *stimulus generalization, setting generalization, transfer of training,* or simply, *generalization.* It is technically incorrect to use *stimulus generalization* to refer to the generalized behavior change achieved by many applied interventions. *Stimulus generalization* refers to the phenomenon in which a response that has been reinforced in the presence of a given stimulus occurs with an increased frequency in the presence of different but similar stimuli under extinction conditions (Guttman & Kalish, 1956; see Chapter 17). *Stimulus generalization* is a technical term referring to a specific behavioral process, and its use should be restricted to those instances (Cuvo, 2003; Johnston, 1979).

Terms such as *collateral* or *side effects, response variability, induction,* and *concomitant behavior change* are often used to indicate the occurrence of behaviors that have not been trained directly. To further complicate matters, *generalization* is often used as a catchall term to refer to all three types of generalized behavior change.

Johnston (1979) discussed some problems caused by using *generalization* (the term for a specific behavioral process) to describe any desirable behavior change in a generalization setting.

> This kind of usage is misleading in that it suggests that a single phenomenon is at work when actually a number of different phenomena need to be described, explained, and controlled. . . . Carefully designing procedures to optimize the contributions of stimulus and response generalization would hardly exhaust our repertoire of tactics for getting the subject to behave in a desirable way in noninstructional settings. Our successes will be more frequent when we realize that maximizing behavioral influence in such settings requires careful consideration of *all* behavioral principles and processes. (pp. 1–2)

Inconsistent use of the "terminology of generalization" can lead researchers and practitioners to incorrect assumptions and conclusions regarding the principles and processes responsible for the presence or absence of generalized outcomes. Nevertheless, applied behavior analysts will probably continue to use **generalization** as a dual-purpose term, referring sometimes to types of behavior change and sometimes to behavioral processes that can bring such changes about. Stokes and Baer (1977) clearly indicated their awareness of the differences in definitions.

> The notion of generalization developed here is an essentially pragmatic one; it does not closely follow the traditional conceptualizations (Keller & Schoenfeld, 1950; Skinner, 1953). In many ways, this discussion will sidestep much of the controversy concerning terminology. (p. 350)

While discussing the use of naturally existing contingencies of reinforcement to maintain and extend programmed behavior changes, Baer (1999) explained his preference for using the term *generalization:*

> It is the best of the techniques described here and, interestingly, it does not deserve the textbook definition of "generalization." It is a reinforcement technique, and the textbook definition of generalization refers to unreinforced behavior changes resulting from other directly reinforced behavior changes. . . . [But] we are dealing with the pragmatic use of the word *generalization,* not the textbook meaning. We reinforce each other for using the word pragmatically, and it serves us well enough so far, so we shall probably maintain this imprecise usage. (p. 30, emphasis in original)

In an effort to promote the precise use of the technical terminology of behavior analysis and as a reminder that the phenomena of interest are usually products of multiple behavior principles and procedures, we use terms for generalized behavior change that focus on the type of behavior change rather than the principles or processes that bring it about.

*Response maintenance can be measured under extinction conditions, in which case the relative frequency of continued responding is described correctly in terms of *resistance to extinction.* However, using *resistance to extinction* to describe response maintenance in most applied situations is incorrect because reinforcement typically follows some occurrences of the target behavior in the post-treatment environment.

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behavior's initial appearance in the learner's repertoire has been terminated. For example:

- Sayaka was having difficulty identifying the lowest common denominator (LCD) when adding and subtracting fractions. Her teacher had Sayaka write the steps for finding the LCD on an index card and told her to refer to the card when needed. Sayaka began using the LCD cue card, and the accuracy of her math assignments improved. After using the cue card for a week, Sayaka said she no longer needed it and returned it to her teacher. The next day Sayaka correctly computed the LCD for every problem on a quiz on adding and subtracting fractions.
- On Loraine's first day on the job with a residential landscaping company, a coworker taught her how to use a long-handled tool to extract dandelions, root and all. Without further instruction, Loraine continues to use the tool correctly a month later.
- When he was in the seventh grade, one of Derek's teachers taught him how to write down his assignments and keep materials for each class in separate folders. As a college sophomore, Derek continues to apply those organizational skills to his academic work.

These examples illustrate the relative nature of generalized behavior change. Response maintenance was evident in Sayaka's performance on a math quiz one day after the cue card intervention ended and also in Derek's continued use of the organizational skills he had learned years earlier. How long a newly learned behavior needs to be maintained depends on the importance of that behavior in the person's life. If covertly reciting a telephone number three times after hearing it enables a person to remember the number long enough to dial it correctly when he locates a telephone a few minutes later, sufficient response maintenance has been achieved. Other behaviors, such as self-care and social skills, must be maintained in a person's repertoire for a lifetime.

Setting/Situation Generalization

Setting/situation generalization occurs when a target behavior is emitted in the presence of stimulus conditions other than those in which it was trained directly. We define **setting/situation generalization** as the extent to which a learner emits the target behavior in a setting or stimulus situation that is different from the instructional setting. For example:

- While waiting for his new motorized wheelchair to arrive from the factory, Chaz used a computer simulation program and a joystick to learn how to operate his soon-to-arrive chair. When the new chair arrived, Chaz grabbed the joystick and immediately began zipping up and down the hall and spinning perfectly executed donuts.
- Loraine had been taught to pull weeds from flowerbeds and mulched areas. Although she had never been instructed to do so, Loraine has begun removing dandelions and other large weeds from lawns as she crosses on her way to the flowerbeds.
- After Brandy's teacher taught her to read 10 different C-V-C-E words (e.g., *bike, cute, made*), Brandy could read C-V-C-E words for which she had not received any instruction (e.g., *cake, bite, mute*).

A study by van den Pol and colleagues (1981) provides an excellent example of setting/situation generalization. They taught three young adults with multiple disabilities to eat independently in fast-food restaurants. All three students had previously eaten in restaurants but could not order or pay for a meal without assistance. The researchers began by constructing a task analysis of the steps required to order, pay for, and eat a meal appropriately in a fast-food restaurant. Instruction took place in the students' classroom and consisted of role-playing each of the steps during simulated customer–cashier interactions and responding to questions about photographic slides showing customers at a fast-food restaurant performing the various steps in the sequence. The 22 steps in the task analysis were divided into four major components: locating, ordering, paying, and eating and exiting. After a student had mastered the steps in each component in the classroom, he was given "a randomly determined number of bills equaling two to five dollars and instructed to go eat lunch" at a local restaurant (p. 64). Observers stationed inside the restaurant recorded each student's performance of each step in the task analysis. The results of these generalization probes, which were also conducted before training (baseline) and after training (follow-up) are shown in Figure 28.1. In addition to assessing the degree of generalization from the classroom, which was based on the specific McDonald's restaurant used for most of the probes, the researchers conducted follow-up probes in a Burger King restaurant (also a measure of maintenance).

This study is indicative of the pragmatic approach to assessing and promoting generalized behavior change used by most applied behavior analysts. The setting in which generalized responding is desired can contain one or more components of the intervention that was implemented in the instructional environment, but not all of the components. If the complete intervention program is required to produce behavior change in a novel environment, then no setting/situation generalization can be claimed. However, if some component(s) of the training

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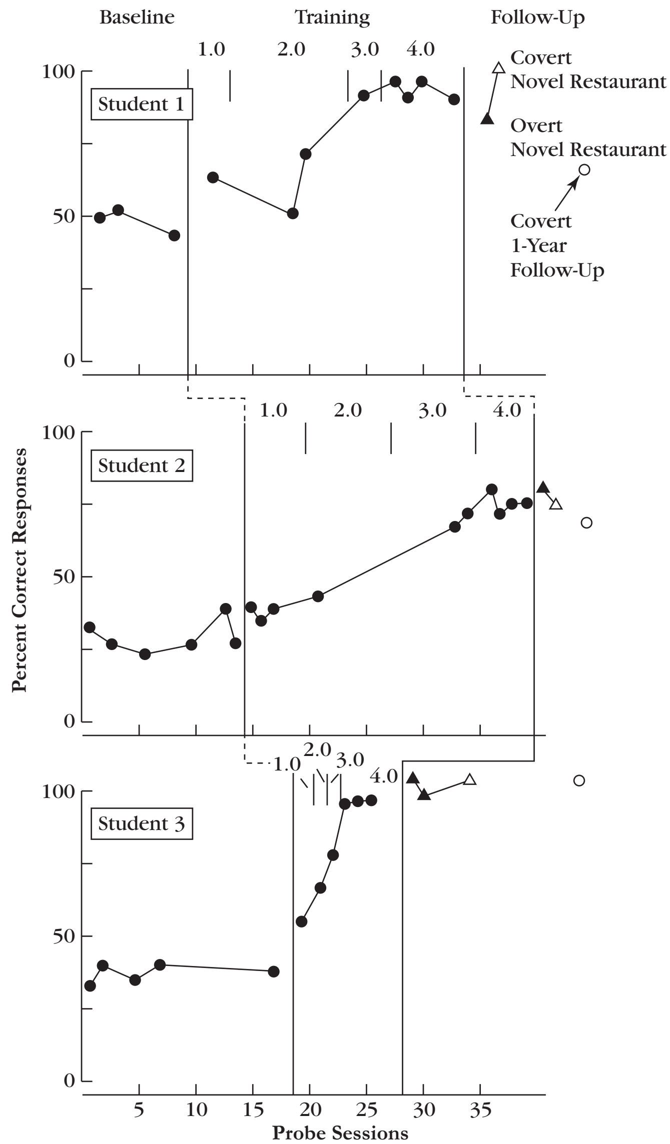

Figure 28.1 Percentage of steps necessary to order a meal at a fast-food restaurant correctly performed by three students with disabilities before, during, and after instruction in the classroom. During follow-up, the closed triangles represent probes conducted at a Burger King restaurant using typical observation procedures, open triangles represent Burger King probes during which students did not know they were being observed, and open circles represent covert probes conducted in a different McDonald's 1 year after training.

From "Teaching the Handicapped to Eat in Public Places: Acquisition, Generalization and Maintenance of Restaurant Skills" by R. A. van den Pol, B. A. Iwata, M. T. Ivanic, T. J. Page, N. A. Neef, and F. P. Whitley, 1981, *Journal of Applied Behavior Analysis, 14,* p. 66. Copyright 1981 by the Society for the Experimental Analysis of Behavior, Inc. Reprinted by permission.

program results in meaningful behavior change in a generalization setting, then setting/situation generalization can be claimed, provided it can be shown that the component(s) used in the generalization setting was insufficient to produce the behavior change alone in the training environment.

For example, van den Pol and colleagues taught Student 3, who was deaf, how to use a prosthetic ordering device in the classroom. The device, a plastic laminated sheet of cardboard with a wax pencil, had preprinted questions (e.g., "How much is . . . ?"), generic item names (e.g., large hamburger), and spaces where the cashier could write responses. Simply giving the student some money and the prosthetic ordering card would not have enabled him to order, purchase, and eat a meal independently. However, after classroom instruction that included guided practice, role playing, social reinforcement ("Good job! You remembered to ask for your change" [p. 64]), corrective feedback, and review sessions with the prosthetic ordering card produced the desired behaviors in the instructional setting, Student 3 was able to order, pay for, and eat meals in a restaurant aided only by the card.

Distinguishing Between Instructional and Generalization Settings

We use **instructional setting** to denote the total environment where instruction occurs, including any aspects of the environment, planned or unplanned, that may influence the learner's acquisition and generalization of the target behavior.[1] Planned elements are the stimuli and

[1]Because the majority of the examples in this chapter are school based, we have used the language of education. For our purposes here, *instruction* can be a synonym for *treatment, intervention,* or *therapy,* and *instructional setting* can be a synonym for *clinical setting* or *therapy setting.*

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events the teacher has programmed in an effort to achieve initial behavior change and promote generalization. Planned elements of an instructional setting for a math lesson, for example, would include the specific math problems to be presented during the lesson and the format and sequencing of those problems. Unplanned aspects of the instructional setting are elements the teacher is not aware of or has not considered that might affect the acquisition and generalization of the target behavior. For example, the phrase, *how much* in a word problem may acquire stimulus control over a student's use of addition, even when the correct solution to the problem requires a different arithmetic operation. Or, perhaps a student always uses subtraction for the first problem on each page of word problems because a subtraction problem has always been presented first during instruction.

A **generalization setting** is any place or stimulus situation that differs in some meaningful way from the instructional setting and in which performance of the target behavior is desired. There are multiple generalization settings for many important target behaviors. The student who learns to solve addition and subtraction word problems in the classroom should be able to solve similar problems at home, at the store, and on the ball diamond with his friends.

Examples of instructional and generalization settings for six target behaviors are shown in Figure 28.2. When a person uses a skill in an environment physically removed from the setting where he learned it—as with Behaviors 1 through 3 in Figure 28.2—it is easy to understand that event as an example of generalization across settings. However, many important generalized outcomes occur across more subtle differences between the instructional setting and generalization setting. It is a mistake to think that a generalization setting must be some*where* different from the place where instruction is provided. Students often receive instruction in the same place where they will need to maintain and generalize what they have learned. In other words, the instructional setting and generalization setting can, and often do, share the same physical location (as with Behaviors 4 through 6 in Figure 28.2).

Distinguishing between Setting/Situation Generalization and Response Maintenance

Because any measure of setting/situation generalization is conducted after some instruction has taken place, it might be argued that setting/situation generalization and response maintenance are the same, or are inseparable phenomena at least. Most measures of setting/situation generalization do provide information on response maintenance, and vice versa. For example, the post-training generalization probes conducted by van den Pol and colleagues (1981) at the Burger King restaurant and at the second McDonald's provided data on setting/situation generalization (i.e., to novel restaurants) and on response maintenance of up to 1 year. However, a functional distinction exists between setting/situation generalization and response maintenance, with each outcome presenting a somewhat different set of challenges for programming and ensuring enduring behavior change. When a behavior change produced in the classroom or clinic is not observed in the generalization environment, a lack of setting/situation generalization is evident. When a behavior change produced in the classroom or clinic has occurred at least once in the generalization setting and then ceases to occur, a lack of response maintenance is evident.

An experiment by Koegel and Rincover (1977) illustrated the functional difference between setting/situation generalization and response maintenance. Participants

Figure 28.2 Examples of an instructional setting and a generalization setting for six target behaviors.

Instructional Setting	Generalization Setting
1. Raising hand when *special education teacher* asks a question in the *resource room.*	1. Raising hand when *general education teacher* asks a question in the *regular classroom.*
2. Practicing conversational skills with *speech therapist at school.*	2. Talking with *peers in town.*
3. Passing basketball during a *team scrimmage on home court.*	3. Passing basketball during a *game on the opponent's court.*
4. Answering *addition problems in vertical format* at desk at school.	4. Answering *addition problems in horizontal format* at desk at school.
5. Solving *word problems with no distracter* numbers on homework assignment.	5. Solving *word problems* with *distracter numbers* on homework assignment.
6. Operating package sealer at community job site *in presence of supervisor.*	6. Operating package sealer at community job site *in absence of supervisor.*

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were three young boys with autism; each was mute, echolalic, or displayed no appropriate contextual speech. One-to-one instructional sessions were conducted in a small room with the trainer and child seated across from each other at a table. Each child was taught a series of imitative responses (e.g., the trainer said, "Touch your [nose, ear]" or "Do this" and [raised his arm, clapped his hands]). Each 40-minute session consisted of blocks of 10 training trials in the instructional setting alternated with blocks of 10 trials conducted by an unfamiliar adult standing outside, surrounded by trees. All correct responses in the instructional setting were followed by candy and social praise. During the generalization trials the children received the same instructions and model prompts as in the classroom, but no reinforcement or other consequences were provided for correct responses in the generalization setting.

Figure 28.3 shows the percentage of trials in which each child responded correctly in the instructional setting and in the generalization setting. All three children learned to respond to the imitative models in the instructional setting. All three children showed 0% correct responding in the generalization setting at the end of the experiment, but for different reasons. Child 1 and Child 3 began emitting correct responses in the generalization setting as their performances improved in the instructional setting, but their generalized responding was not maintained (most likely the result of the extinction conditions in effect in the generalization setting). The imitative responding acquired by Child 2 in the instructional setting never generalized to the outside setting. Therefore, the 0% correct responding at the experiment's conclusion represents a lack of response maintenance for Child 1 and Child 3, but for Child 2 it represents a failure of setting generalization.

Response Generalization

We define **response generalization** as the extent to which a learner emits untrained responses that are functionally equivalent to the trained target behavior. In other words, in response generalization forms of behavior for which no programmed contingencies have been applied appear as a function of the contingencies that have been applied to other responses. For example:

- Traci wanted to earn some extra money by helping her older brother with his lawn mowing business. Her brother taught Traci to walk the mower up and down parallel rows that moved progressively from

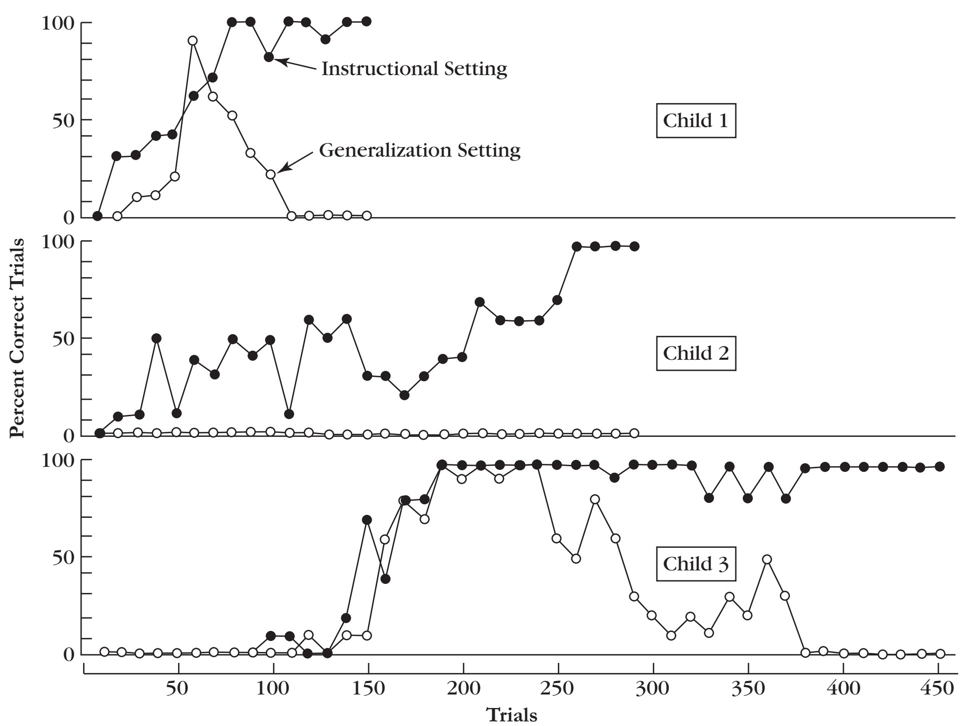

Figure 28.3 Correct responding by three children on alternating blocks of 10 trials in the instructional setting and 10 trials in the generalization setting.

From "Research on the Differences Between Generalization and Maintenance in Extra-Therapy Responding" by R. L. Koegel and A. Rincover, 1977, *Journal of Applied Behavior Analysis, 10,* p. 4. Copyright 1977 by the Society for the Experimental Analysis of Behavior, Inc. Reprinted by permission.

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one side of a lawn to the other. Traci discovered that she could mow some lawns just as quickly by first cutting around the perimeter of the lawn and then walking the mower in concentric patterns inward toward the center of the lawn.

- Loraine was taught to remove weeds with a long weed-removal tool. Although she has never been taught or asked to do so, sometimes Loraine removes weeds with a hand trowel or with her bare hands.
- Michael's mother taught him how to take phone messages by using the pencil and notepaper next to the phone to write the caller's name, phone number, and message. One day, Michael's mother came home and saw her son's tape recorder next to the phone. She pushed the play button and heard Michael's voice say, "Grandma called. She wants to know what you'd like her to cook for dinner Wednesday. Mr. Stone called. His number is 555-1234, and he said the insurance payment is due."

The study by Goetz and Baer (1973) described in Chapter 8 of the block building by three preschool girls provides a good example of response generalization. During baseline the teacher sat by each girl as she played with the blocks, watching closely but quietly, and displaying neither enthusiasm nor criticism for any particular use of the blocks. During the next phase of the experiment, each time the child placed or rearranged the blocks to create a new form that had not appeared previously in that session's constructions, the teacher commented with enthusiasm and interest (e.g., "Oh, that's very nice—that's different!"). Another phase followed in which each repeated construction of a given form within the session was praised (e.g., "How nice—another arch!"). The study ended with a phase in which descriptive praise was again contingent on the construction of different block forms. All three children constructed more new forms with the blocks when form diversity was reinforced than they did under baseline or under the reinforcement-for-the-same-forms condition (see Figure 8.7).

Even though specific responses produced reinforcement (i.e., the actual block forms that preceded each instance of teacher praise), other responses sharing that functional characteristic (i.e., being different from block forms constructed previously by the child) increased in frequency as a function of the teacher's praise. As a result, during reinforcement for different forms, the children constructed new forms with the blocks even though each new form itself had never before appeared and therefore could not have been reinforced previously. Reinforcing a few members of the response class of new forms increased the frequency of other members of the same response class.

Generalized Behavior Change: A Relative and Intermixed Concept

As the examples presented previously show, generalized behavior change is a relative concept. We might think of it as existing along a continuum. At one end of the continuum are interventions that might produce a great deal of generalized behavior change; that is, after all components of an intervention have been terminated, the learner may emit the newly acquired target behavior, as well as several functionally related behaviors not observed previously in his repertoire, at every appropriate opportunity in all relevant settings, and he may do so indefinitely. At the other end of the continuum of generalized outcomes are interventions that yield only a small amount of generalized behavior change—the learner uses the new skill only in a limited range of nontraining settings and situations, and only after some contrived response prompts or consequences are applied.

We have presented each of the three primary forms of generalized behavior change individually to isolate its defining features, but they often overlap and occur in combination. Although it is possible to obtain response maintenance without generalization across settings/situations or behaviors (i.e., the target behavior continues to occur in the same setting in which it was trained after the training contingencies have been terminated), any meaningful measure of setting generalization will entail some degree of response maintenance. And it is common for all three forms of generalized behavior change to be represented in the same instance. For example, during a relatively quiet shift at the widget factory on Monday, Joyce's supervisor taught her to obtain assistance by calling out, "Ms. Johnson, I need some help." Later that week (response maintenance) when it was very noisy on the factory floor (setting/situation generalization), Joyce signaled her supervisor by waving her hand back and forth (response generalization).

Generalized Behavior Change Is Not Always Desirable

It is hard to imagine any behavior that is important enough to target for systematic instruction for which response maintenance would be undesirable. However, unwanted setting/situation generalization and response generalization occur often, and practitioners should design intervention plans to prevent or minimize such unwanted outcomes. Undesirable setting/situation generalization takes two common forms: overgeneralization and faulty stimulus control.

Overgeneralization, a nontechnical but effectively descriptive term, refers to an outcome in which the

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behavior has come under the control of a stimulus class that is too broad. That is, the learner emits the target behavior in the presence of stimuli that, although similar in some way to the instructional examples or situation, are inappropriate occasions for the behavior. For example, a student learns to spell *division, mission,* and *fusion* with the grapheme, *–sion.* When asked to spell *fraction,* the student writes *f-r-a-c-s-i-o-n.*

With *faulty stimulus control,* the target behavior comes under the restricted control of an irrelevant antecedent stimulus. For example, after learning to solve word problems such as, "Natalie has 3 books. Amy has 5 books. How many books do they have in total?" by adding the numerals in the problem, the student adds the numerals in any problem that includes the words "in total" (e.g., "Corinne has 3 candies. Amanda and Corinne have 8 candies in total. How many candies does Amanda have?").[2]

Undesired response generalization occurs when any of a learner's untrained but functionally equivalent responses results in poor performance or undesirable outcomes. For example, although Jack's supervisor at the widget factory taught him to operate the drill press with two hands because that is the safest method, sometimes Jack operates the press with one hand. One-handed responses are functionally equivalent to two-handed responses because both topographies cause the drill press to stamp out a widget, but one-handed responses compromise Jack's health and the factory's safety record. Or, perhaps some of her brother's customers do not like how their lawns look after Traci has mowed them in concentric rectangles.

Other Types of Generalized Outcomes

Other types of generalized outcomes that do not fit easily into categories of response maintenance, setting/situation generalization, and response generalization have been reported in the behavior analysis literature. For example, complex members of a person's repertoire sometimes appear quickly with little or no apparent direct conditioning, such as the *stimulus equivalence* relations described in Chapter 17 (Sidman, 1994). Another type of such rapid learning that appears to be a generalized outcome of other events has been called *contingency adduction,* a process whereby a behavior that was initially selected and shaped under one set of conditions is recruited by a different set of contingencies and takes on a new function in a person's repertoire (Adronis, 1983; Johnson & Layng, 1992).

Sometimes an intervention applied to one or more people results in behavior changes in other people who were not directly treated by the contingencies. **Generalization across subjects** refers to changes in the behavior of people not directly treated by an intervention as a function of treatment contingencies applied to other people. This phenomenon, which has been described with a variety of related or synonymous terms—*vicarious reinforcement* (Bandura, 1971; Kazdin, 1973), *ripple effect* (Kounin, 1970), and *spillover effect* (Strain, Shores, & Kerr, 1976)—provides another dimension for assessing the generalization of treatment effects. For example, Fantuzzo and Clement (1981) examined the degree to which behavior changes would generalize from one child who received teacher-administered or self-administered token reinforcement during a math activity to a peer seated next to the child.

Drabman, Hammer, and Rosenbaum (1979) combined four basic types of generalized treatment effects—(a) across time (i.e., response maintenance), (b) across settings (i.e., setting/situation generalization), (c) across behaviors (i.e., response generalization), and (d) across subjects—into a conceptual framework they called the *generalization map.* By viewing each type of generalized outcome as dichotomous (i.e., either present or absent) and by combining all possible permutations of the four categories, Drabman and colleagues arrived at 16 categories of generalized behavior change ranging from maintenance (Class 1) to subject-behavior-setting-time generalization (Class 16). Class 1 generalization is evident if the target behavior of the target subject(s) continues in the treatment setting after any "experiment-controlled contingencies" have been discontinued. Class 16 generalization, which Drabman and colleagues (1979) called the "ultimate form" of generalization, is evidenced by "a change in a nontarget subject's nontarget behavior which endures in a different setting after the contingencies have been withdrawn in the treatment setting" (p. 213).

Although Drabman and colleagues recognized that "with any heuristic technique the classifications may prove arbitrary" (p. 204), they provided objectively stated rules for determining whether a given behavioral event fits the requirements of each of their 16 classifications. Regardless of whether generalized behavior change consists of such distinctly separate and wide-ranging phenomena as detailed by Drabman and colleagues, their generalization map provided an objective framework by which the extended effects of behavioral interventions can be described and communicated. For example, Stevenson and Fantuzzo (1984) measured 15 of the 16 generalization map categories in a study of the effects of teaching a fifth-grade boy to use self-management

[2]Examples of faulty stimulus control caused by flaws in the design of instructional materials, and suggestions for detecting and correcting those flaws, can be found in J. S. Vargas (1984).

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techniques. They not only measured the effects of the intervention on the target behavior (math performance) in the instructional setting (school), but they also assessed effects on the student's math behavior at home, disruptive behavior at home and at school, both behaviors for a nontreated peer in both settings, and maintenance of all of the above.

Planning for Generalized Behavior Change

> In general, generalization should be programmed, rather than expected or lamented.
>
> —Baer, Wolf, and Risley (1968, p. 97)

In their review of 270 published studies relevant to generalized behavior change, Stokes and Baer (1977) concluded that practitioners should always "assume that generalization does not occur except through some form of programming . . . and act as if there were no such animal as 'free' generalization—as if generalization never occurs 'naturally,' but always requires programming" (p. 365). Of course, generalization of some type and degree does usually occur, whether or not it is planned. Such unplanned and unprogrammed generalization may be sufficient, but often it is not, particularly for many learners served by applied behavior analysts (e.g., children and adults with learning problems and developmental disabilities). And if left unchecked, unplanned generalized outcomes may be undesirable outcomes.

Achieving optimal generalized outcomes requires thoughtful, systematic planning. This planning begins with two major steps: (1) selecting target behaviors that will meet natural contingencies of reinforcement, and (2) specifying all desired variations of the target behavior and the settings/situations in which it should (and should not) occur after instruction has ended.

Selecting Target Behaviors That Will Meet Naturally Existing Contingencies of Reinforcement

> The everyday environment is full of steady, dependable, hardworking sources of reinforcement for almost all of the behaviors that seem natural to us. That is why they seem natural to us.
>
> —Donald M. Baer (1999, p. 15)

Numerous criteria have been suggested for determining whether a proposed teaching objective is relevant or functional for the learner. For example, the age-appropriateness of a skill and the degree to which it represents normalization are often cited as important criteria for choosing target behaviors for students with disabilities (e.g., Snell & Brown, 2006). Each of these criteria was discussed in Chapter 3, along with numerous other issues that should be considered when selecting and prioritizing target behaviors. In the end, however, there is just one ultimate criterion of functionality: *A behavior is functional only to the extent that it produces reinforcement for the learner.* This criterion holds no matter how important the behavior may be to the person's health or welfare, or no matter how much teachers, family, friends, or the learner himself considers the behavior to be desirable. To repeat: A behavior is not functional if it does not produce reinforcement for the learner. Said another way: Behaviors that are not followed by reinforcers on at least some occasions will not be maintained.

Ayllon and Azrin (1968) recognized this fundamental truth when they recommended that practitioners follow the *relevance-of-behavior rule* when selecting target behaviors. The rule: Choose only those behaviors to change that will produce reinforcers in the postintervention environment. Baer (1999) believed so strongly in the importance of this criterion that he recommended that practitioners heed a similar rule:

> *A good rule is to not make any deliberate behavior changes that will not meet natural communities of reinforcement.* Breaking this rule commits you to maintain and extend the behavior changes that you want, by yourself, indefinitely. If you break this rule, do so knowingly. Be sure that you are willing and able to do what will be necessary. (p. 16, emphasis in original)

Programming for the generalization and maintenance of any behavior for which a natural contingency of reinforcement exists, no matter the specific tactics employed, consists of getting the learner to emit the behavior in the generalization setting just often enough to contact the occurring contingencies of reinforcement. Generalization and maintenance of the behavior from that point forward, while not assured, is a very good bet. For example, after receiving some basic instruction on how to operate the steering wheel, gas pedal, and brakes on a car, the naturally existing reinforcement and punishment contingencies involving moving automobiles and the road will select and maintain effective steering, acceleration, and braking. Very few drivers need booster training sessions on the basic operation of the steering wheel, gas pedal, and brakes.

We define a **naturally existing contingency** as any contingency of reinforcement (or punishment) that operates independent of the behavior analyst's or practitioner's efforts. This is a pragmatic, functional conception of a naturally existing contingency defined by the absence of the behavior analyst's efforts. Naturally existing contingencies include contingencies that operate

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without social mediation (e.g., walking fast on an icy sidewalk is often punished by a slip and fall) and socially mediated contingencies contrived and implemented by other people in the generalization setting. From the perspective of a special educator who is teaching a set of targeted social and academic skills to students for whom the general education classroom represents the generalization setting, a token economy operated by the general education classroom teacher is an example of the latter type of naturally existing contingency.[3] Even though the token economy was contrived by the teacher in the general education classroom, it is a naturally existing contingency because it already operates in the generalization setting.

We define a **contrived contingency** as any contingency of reinforcement (or punishment) designed and implemented by a behavior analyst or practitioner to achieve the acquisition, maintenance, and/or generalization of a targeted behavior change. From the perspective of the teacher in the general education classroom who designed and implemented it, the token economy in the previous example is a contrived contingency.

In reality, practitioners are often charged with the difficult task of teaching important skills for which there are no dependable naturally existing contingencies of reinforcement. In such cases, practitioners should realize and plan for the fact that the generalization and maintenance of target behaviors will have to be supported, perhaps indefinitely, with contrived contingencies.

Specifying All Desired Variations of the Behavior and the Settings/Situations Where It Should (and Should Not) Occur

This stage of planning for generalized outcomes includes identifying all the desired behavior changes that need to be made and all the environments and stimulus conditions in which the learner should emit the target behavior(s) after direct training has ceased (Baer, 1999). For some target behaviors, the most important stimulus control for each response variation is clearly defined (e.g., reading C-V-C-E words) and restricted in number (e.g., solving multiplication facts). For many important target behaviors, however, the learner is likely to encounter a multitude of settings and stimulus conditions where the behavior, in a wide variety of response forms, is desired. Only by considering these possibilities prior to instruction can the behavior analyst design an intervention with the best chance of preparing the learner for them.

In one sense, this component of planning for generalized outcomes is similar to preparing a student for a future test without knowing the content or the format of all of the questions that will be on the test. The stimulus conditions and contingencies of reinforcement that exist in the generalization setting(s) will provide that test to the learner. Planning involves trying to determine what the final exam will cover (type and form of questions), whether there will be any trick questions (e.g., confusing stimuli that might evoke the target response when it should not occur), and whether the learner will need to use his new knowledge or skill in different ways (response generalization).

List All the Behaviors That Need to Be Changed

A list should be made of all the forms of the target behavior that need to be changed. This is not an easy task, but a necessary one to obtain a complete picture of the teaching task ahead. For example, if the target behavior is teaching Brian, the young boy with autism, to greet people, he should learn a variety of greetings in addition to "Hello, how are you?" Brian may also need many other behaviors to initiate and participate in conversations, such as responding to questions, taking turns, staying on topic, and so forth. He may also need to be taught when and with whom to introduce himself. Only by having a complete list of all the desired forms of the behavior can the practitioner make meaningful decisions about which behaviors to teach directly and which to leave to generalization.

The practitioner should determine whether and to what extent response generalization is desirable for all of the behavior changes listed, and then, make a prioritized list of the variations of the target behavior he would like to see as generalized outcomes.

List All the Settings and Situations in Which the Target Behavior Should Occur

A list should be made of all the desired settings and situations in which the learner will emit the target behavior if optimal generalization is achieved. Will Brian need to introduce himself and talk with children his own age, to adults, to males and females? Will he need to talk with others at home, at school, in the lunchroom, on the playground? Will he be confronted with situations that may appear to be appropriate opportunities to converse but are not (e.g., an unknown adult approaches and offers candy) and for which an alternative response is needed (e.g., walking away, seeking out a known adult). (This kind of analysis often adds additional behaviors to the list of skills to be taught.)

When all of the possible situations and settings have been identified, they should be prioritized according to

[3]Token economies are described in Chapter 26.

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their importance and the client's likelihood of encountering them. Further analysis of the prioritized environments should then be conducted. What discriminative stimuli usually set the occasion for the target behavior in these various settings and situations? What schedules of reinforcement for the target behavior are typical in these nontraining environments? What kinds of reinforcers are likely to be contingent on the emission of the target behavior in each of the settings? Only when she has answered all of these questions, if not by objective observation then at least by considered estimation, can the behavior analyst begin to have a full picture of the teaching task ahead.

Is the Pre-Intervention Planning Worth It?

Obtaining all of the information just described requires considerable time and effort. Given limited resources, why not design an intervention and immediately begin trying to change the target behavior? It is true that many behavior changes do show generalization, even though the extension of the trained behavior across time, settings, and other behaviors was unplanned and unprogrammed. When target behaviors have been chosen that are truly functional for the subject and when those behaviors have been brought to a high level of proficiency under discriminative stimuli relevant to generalization settings, the chances of generalization are good. But what constitutes a high level of proficiency for certain behaviors in various settings? What are all of the relevant discriminative stimuli in all of the relevant settings? What are all the relevant settings?

Without a systematic plan, a practitioner will usually be ignorant of the answers to these vital questions. Few behaviors that are important enough to target have such limited needs for generalized outcomes that the answers to such questions are obvious. Just a cursory consideration of the behaviors, settings, and people related to a child introducing himself revealed numerous factors that may need to be incorporated into an instructional plan. A more thorough analysis would produce many more. In fact, a complete analysis will invariably reveal more behaviors to be taught, to one person or another, than time or resources would ever allow. And Brian—the 10-year-old who is learning to greet people and introduce himself—in all likelihood needs to learn many other skills also, such as self-help, academic, and recreation and leisure skills, to name just a few. Why then create all the lists in the first place when everything cannot be taught anyway? Why not just train and hope?[4]

[4]Teaching a new behavior without developing and implementing a plan to facilitate its maintenance and generalization is done so often that Stokes and Baer 1977) called it the "train and hope" approach to generalization.

Baer (1999) described six possible benefits of listing all the forms of behavior change and all the situations in which these behavior changes should occur.

1. You now see the full scope of the problem ahead of you, and thus see the corresponding scope that your teaching program needs to have.
2. If you teach less than the full scope of the problem, you do so by choice rather than by forgetting that some forms of the behavior could be important, or that there were some other situations in which the behavior change should or should not occur.
3. If less than a complete teaching program results in less than a complete set of behavior changes, you will not be surprised.
4. You can decide to teach less than there is to learn, perhaps because that is all that is practical or possible for you to do.
5. You can decide what is most important to teach. You can also decide to teach the behavior in a way that encourages the indirect development of some of the other forms of the desired behavior, as well as the indirect occurrence of the behavior in some other desired situations, that you will not or cannot teach directly.
6. But if you choose the option discussed in number 5 above, rather than the complete program implicit in number 1, you will do so knowing that the desired outcome would have been more certain had you taught every desirable behavior change directly. The best that you can do is to encourage the behavior changes that you do not cause directly. So, you will have chosen the option in number 5 either of necessity or else as a well-considered gamble after a thoughtful consideration of possibilities, costs, and benefits. (pp. 10–11)

After determining which behaviors to teach directly and in which situations and settings to teach those behaviors, the behavior analyst is ready to consider strategies and tactics for achieving generalization to untrained behaviors and settings.

Strategies and Tactics for Promoting Generalized Behavior Change

Various authors have described conceptual schemes and taxonomies of methods for promoting generalized behavior change (e.g., Egel, 1982; Horner, Dunlap, & Koegel, 1988; Osnes & Lieblein, 2003; Stokes & Baer,

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1977; Stokes & Osnes, 1989). The conceptual scheme presented here is informed by the work of those authors and others, and by our own experiences in designing, implementing, and evaluating procedures for promoting generalized outcomes and in teaching practitioners to use them. Although numerous methods and techniques have been demonstrated and given a variety of names, most tactics that effectively promote generalized behavior change can be classified under five strategic approaches:

- Teach the full range of relevant stimulus conditions and response requirements.
- Make the instructional setting similar to the generalization setting.
- Maximize the target behavior's contact with reinforcement in the generalization setting.
- Mediate generalization.
- Train to generalize.

In the following sections we describe and provide examples of 13 tactics applied behavior analysts have used to accomplish these five strategies (see Figure 28.4). Although each tactic is described individually, most efforts to promote generalized behavior change entail a combination of these tactics (e.g., Ducharme & Holborn, 1997; Grossi, Kimball, & Heward, 1994; Hughes, Harmer, Killina, & Niarhos, 1995; Ninness, Fuerst, & Rutherford, 1991; Trask-Tyler, Grossi, & Heward, 1994).

Teach the Full Range of Relevant Stimulus Conditions and Response Requirements

> The most common mistake that teachers make, when they want to establish a generalized behavior change, is to teach one good example of it and expect the student to generalize from that example.
>
> — Donald M. Baer (1999, p. 15)

To be most useful, most important behaviors must be performed in various ways across a wide range of stimulus conditions. Consider a person skilled in reading, math, conversing with others, and cooking. That person can read thousands of different words; add, subtract, multiply, and divide any combination of numbers; make a multitude of relevant and appropriate comments when talking with others; and measure, combine, and prepare numerous ingredients in hundreds of recipes. Helping learners achieve such wide-ranging performances presents an enormous challenge to the practitioner.

One approach to this challenge would be to teach every desired form of a target behavior in every setting/situation in which the learner may need that behavior in the future. Although this approach would eliminate the need to program for response generalization and setting/situation generalization (response maintenance would remain the only problem), it is seldom possible and never practical. A teacher cannot provide direct instruction on every printed word a student may encounter in the future, or teach a student every measuring, pouring, stirring, and sautéing movement needed to make every dish

Figure 28.4 Strategies and tactics for promoting generalized behavior change.

Teach the Full-Range of Relevant Stimulus Conditions and Response Requirements
1. Teach sufficient stimulus examples
2. Teach sufficient response examples

Make the Instructional Setting Similar to the Generalization Setting
3. Program common stimuli
4. Teach loosely

Maximize Contact with Reinforcement in the Generalization Setting
5. Teach the target behavior to levels of performance required by naturally existing contingencies of reinforcement
6. Program indiscriminable contingencies
7. Set behavior traps
8. Ask people in the generalization setting to reinforce the target behavior
9. Teach the learner to recruit reinforcement

Mediate Generalization
10. Contrive a mediating stimulus
11. Teach self-management skills

Train to Generalize
12. Reinforce response variability
13. Instruct the learner to generalize

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he may want to make in the future. Even for most skill areas for which it would be *possible* to teach every possible example (e.g., instruction *could* be provided on all 900 different single-digit-times-two-digit multiplication problems), to do so would be impractical for many reasons, not the least of which is that the student needs to learn not only many other types of math problems but also skills in other curriculum areas.

A general strategy called **teaching sufficient examples** consists of teaching the student to respond to a subset of all of the possible stimulus and response examples and then assessing the student's performance on untrained examples.[5] For example, the generalization of a student's ability to solve two-digit-minus-two-digit arithmetic problems with regrouping can be assessed by asking the student to solve several problems of the same type for which no instruction or guided practice has been provided. If the results of this **generalization probe** show that the student responds correctly to untaught examples, then instruction can be halted on this class of problems. If the student performs poorly on the generalization probe, the practitioner teaches additional examples before again assessing the student's performance on a new set of untaught examples. This cycle of teaching new examples and probing with untaught examples continues until the learner consistently responds correctly to untrained examples representing the full range of stimulus conditions and response requirements found in the generalization setting.

Teach Sufficient Stimulus Examples

The tactic for promoting setting/situation generalization called *teaching sufficient stimulus examples* involves teaching the learner to respond correctly to more than one example of antecedent stimulus conditions and probing for generalization to untaught stimulus examples. A different stimulus example is incorporated into the teaching program each time a change is made in any dimension of the instructional item itself or the environmental context in which the item is taught. Examples of four dimensions by which different instructional examples can be identified and programmed are the following:

- The specific *item* taught (e.g., multiplication facts: 7 × 2, 4 × 5; letter sounds: *a, t*)
- The *stimulus context* in which the item is taught (e.g., multiplication facts presented in *vertical format,* in *horizontal format,* in *word problems;* saying the sound of *t* when it appears at the beginning and end of words: *t*ab, ba*t*)
- The *setting* where instruction occurs (e.g., large-group instruction at school, collaborative learning group, home)
- The *person* doing the teaching (e.g., classroom teacher, peer, parent)

As a general rule, the more examples the practitioner uses during instruction, the more likely the learner will respond correctly to untrained examples or situations. The actual number of examples that must be taught before sufficient generalization occurs will vary as a function of factors such as the complexity of the target behavior being taught, the teaching procedures employed, the student's opportunities to emit the target behavior under the various conditions, the naturally existing contingencies of reinforcement, and the learner's history of reinforcement for generalized responding.

Sometimes teaching as few as two examples will produce significant generalization to untaught examples. Stokes, Baer, and Jackson (1974) taught a greeting response to four children with severe mental retardation who seldom acknowledged or greeted other people. The senior author, working as a dormitory assistant, used unconditioned reinforcers (potato chips and M&Ms) and praise to shape the greeting response (at least two back-and-forth waves of a raised hand). Then this initial trainer maintained the newly learned hand wave by contriving three to six contacts per day with each of the children in various settings (e.g., playroom, corridor, dormitory, courtyard). Throughout the study as many as 23 different staff members systematically approached the children during different times of the day in different settings and recorded whether the children greeted them with a hand waving response. If a child greeted a prober with the waving response, the prober responded with "Hello, (name)." Approximately 20 such generalization probes were conducted each day with each child.

Immediately after learning the greeting response with just one trainer, one of the children (Kerry) showed good setting/situation generalization by using it appropriately in most of her contacts with other staff members. However, the other three children usually failed to greet staff members most of the time, even though they continued to greet the original trainer on virtually every occasion. A second staff member then began to reinforce and maintain the greeting responses of these three children. As a result of adding the second trainer, the children's greeting behavior showed widespread generalization to the other staff members. Stokes and colleagues' (1974) study is important for at least two reasons. First, it demonstrated an effective method for continual assessment of setting/situation generalization across numerous examples (in this case, people). Second, the study showed that it is

[5]Other terms commonly used for this strategy for promoting generalized behavior change are *training sufficient exemplars* (Stokes & Baer, 1977) and *training diversely* (Stokes & Osnes, 1989).

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sometimes possible to produce widespread generalization by programming only two examples.

Teach Sufficient Response Examples

Instruction that provides practice with a variety of response topographies helps to ensure the acquisition of desired response forms and also promotes response generalization in the form of untrained topographies. Often called **multiple exemplar training,** this tactic typically incorporates both stimulus and response variations. Multiple exemplar training was used to achieve the acquisition and generalization of affective behavior by children with autism (Gena, Krantz, McClannahan, & Poulson, 1996); cooking skills by young adults with disabilities (Trask-Tyler, Grossi, & Heward, 1994); domestic skills (Neef, Lensbower, Hockersmith, DePalma, & Gray, 1990); vocational skills (Horner, Eberhard, & Sheehan, 1986); daily living skills (Horner, Williams, & Steveley, 1987); and requests for assistance (Chadsey-Rusch, Drasgow, Reinoehl, Halle, & Collet-Klingenberg, 1993).

Four female high school students with moderate mental retardation participated in a study by Hughes and colleagues (1995) that assessed the effects of an intervention they called *multiple-exemplar self-instructional training* on the acquisition and generalization of the students' conversational interactions with peers. The young women were recommended for the study because they initiated conversations and responded to peers efforts to talk with them at "low or nonexistent rates" and maintained little eye contact. One of the students, Tanya, had recently been refused a job at a restaurant because of her "reticence and lack of eye contact during her job interview" (p. 202).

A key element of Hughes and colleagues' intervention was practicing a wide variety of conversation starters and statements with different peer teachers. Ten volunteer peer teachers recruited from general education classrooms helped teach conversation skills to the participants. The peer teachers were male and female, ranged in grade level from freshmen to seniors, and represented African American, Asian American, and Euro-American ethnic groups. Instead of learning a few scripted conversation openers, the participants practiced using multiple examples of conversation starters selected from a pooled list of conversation openers used by general education students. Additionally, participants were encouraged to develop individual adaptations of statements, which further promoted response generalization by increasing the number and range of conversational statements that were likely to be used in subsequent conversations.

Before, during, and after multiple exemplar training, generalization probes were conducted of each participant's use of self-instructions, eye contact, and initiating and responding to conversation partners. The 23 to 32 different students who served as conversation partners for each participant represented the full range of student characteristics in the school population (e.g., gender, age, ethnicity, students with and without disabilities) and included students who were known and unknown to the participants prior to the study. The rate of conversation initiations by all four participants increased during multiple exemplar training to levels approximating those of general education students and was maintained at those rates after the intervention was terminated completely (see Figure 28.5).

General Case Analysis

Teaching a learner to respond correctly to multiple examples will not automatically produce generalized responding to untaught examples. To achieve an optimal degree of generalization and discrimination, the behavior analyst must pay close attention to the specific examples used during instruction; not just any examples will do. Optimally effective instructional design requires selecting teaching examples that represent the full range of stimulus situations and response requirements in the natural environment.[6] **General case analysis** (also called *general case strategy*) is a systematic method for selecting teaching examples that represent the full range of stimulus variations and response requirements in the generalization setting (Albin & Horner, 1988; Becker & Engelmann, 1978; Engelmann & Carnine, 1982).

A series of studies by Horner and colleagues demonstrated the importance of teaching examples that systematically sample the range of stimulus variations and response requirements the learner will encounter in the generalization setting (e.g., Horner, Eberhard, & Sheehan, 1986; Horner & McDonald, 1982; Horner, Williams, & Steveley, 1987). In a classic example of this line of research, Sprague and Horner (1984) evaluated the effects of general case instruction on the generalized use of vending machines by six high school students with moderate to severe mental retardation. The dependent variable was the number of vending machines each student operated correctly during generalization probes of 10 different machines located within the community. For a probe trial to be scored as correct, a student had to correctly perform a chain of five responses (i.e., insert the proper number of coins, activate the machine for the desired item, and so on). The researchers selected the 10 vending machines used to assess generalization because each student's performance on those machines would serve as an index of

[6]Siegfried Engelmann and Douglas Carnine's (1982) *Theory of Instruction: Principles and Applications* is one of the most thorough and sophisticated treatments of the selection and sequencing of teaching examples for effective and efficient curriculum design.

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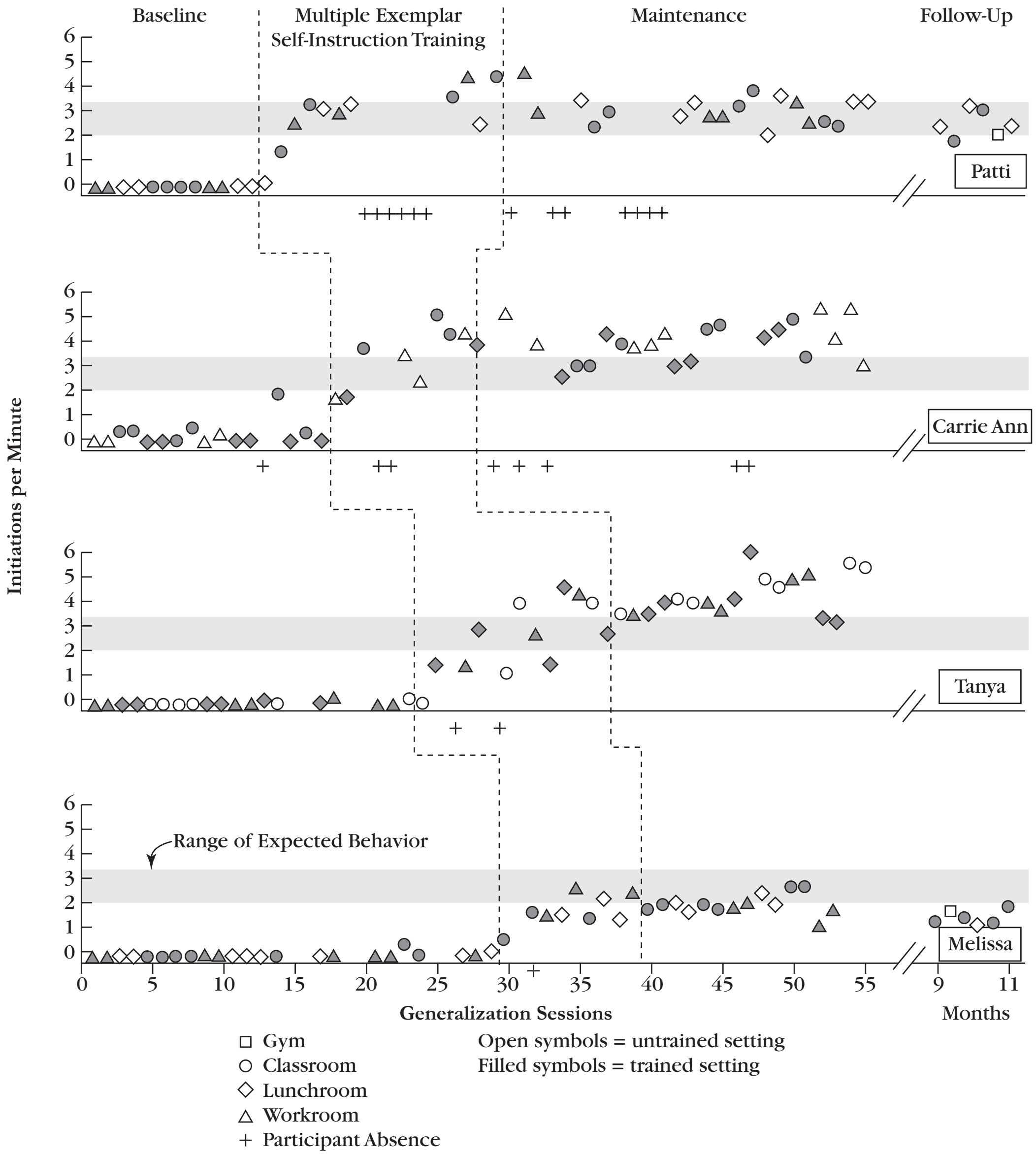

Figure 28.5 Conversation initiations per minute by four high school students with disabilities to conversation partners with and without disabilities during generalization sessions. The shaded bands represent typical performance by general education students.

From "The Effects of Multiple-Exemplar Training on High-School Students' Generalized Conversational Interactions" by C. Hughes, M. L. Harmer, D. J. Killina, and F. Niarhos, 1995. *Journal of Applied Behavior Analysis, 28,* p. 210. Copyright 1995 by the Society for the Experimental Analysis of Behavior, Inc. Reprinted by permission.

his performance "across all vending machines dispensing food and beverage items costing between $.20 and $.75 in Eugene, Oregon" (p. 274). None of the vending machines used in the generalization probes was identical to any of the vending machines used during instruction.

After a single-baseline probe verified each student's inability to use the 10 vending machines in the community, a condition the researchers called "single-instance instruction" began. Under this condition each student received individual training on a single vending machine located in the school until he used the machine independently for three consecutive correct trials on each of two consecutive days. Even though each student had learned to operate the training machine without errors, the generalization probe following single-instance instruction revealed little or no success with the vending machines in the community (see Probe Session 2 in Figure 28.6). The continued poor performance of Students 2, 3, 5, and 6 on successive generalization probes that followed additional instruction with the single-instance training machine shows that overlearning on a single example does not necessarily aid generalization. Further evidence of the limited generalization obtained from single-instance instruction is the fact that seven of

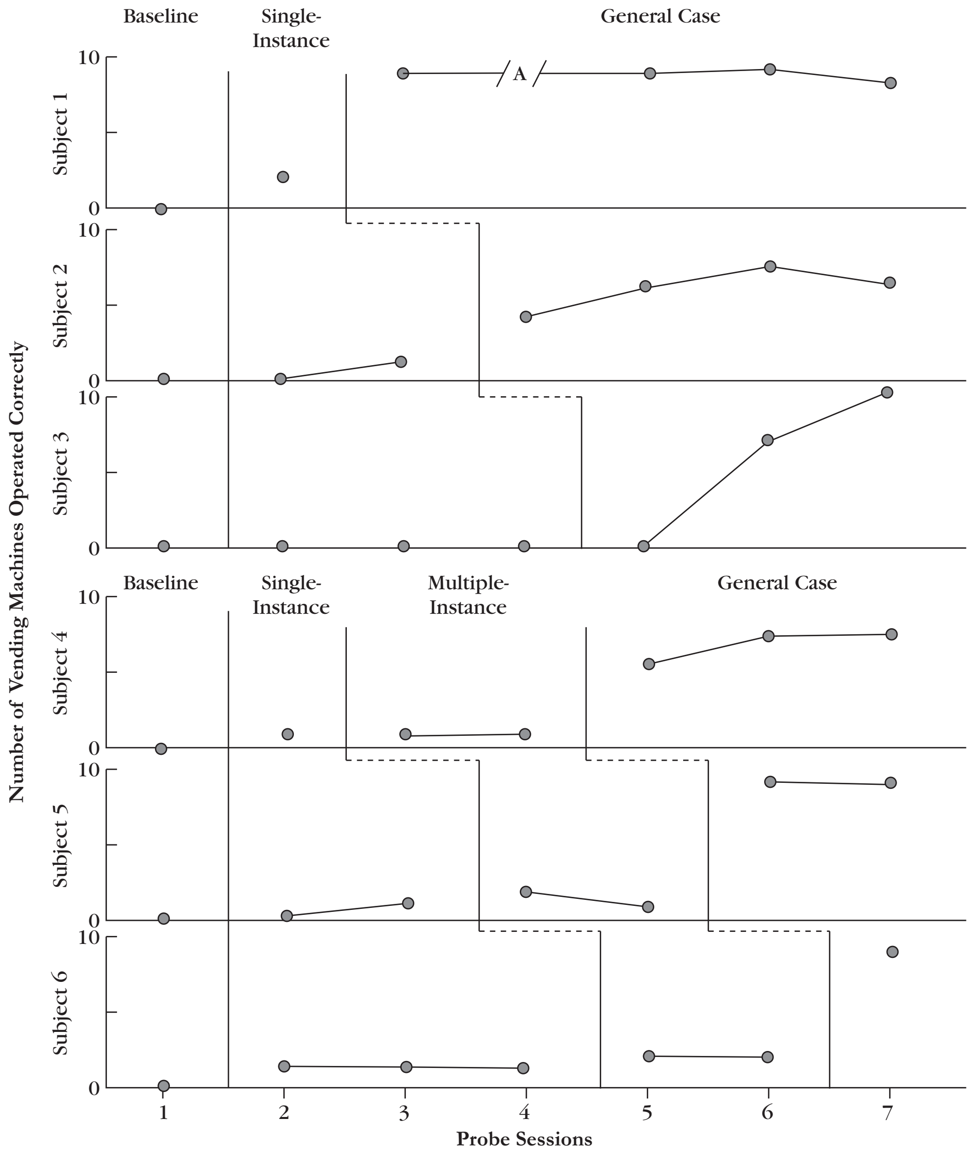

Figure 28.6 The number of nontrained probe machines operated correctly by students across phases and probe sessions.

From "The Effects of Single Instance, Multiple Instance, and General Case Training on Generalized Vending Machine Use by Moderately and Severely Handicapped Students" by J. R. Sprague and R. H. Horner, 1984, *Journal of Applied Behavior Analysis, 17,* p. 276. Copyright 1984 by the Society for the Experimental Analysis of Behavior, Inc. Reprinted by permission.

the eight total probe trials performed correctly by all students after single-instance instruction were on Probe Machine 1, the vending machine that most closely resembled the machine on which the students had been trained.

Next, multiple-instance training was implemented with Students 4, 5, and 6. The teaching procedures and performance criteria for multiple-instance training were the same as those used in the single-instance condition except that each student received instruction until he reached criterion on all three new machines. Sprague and Horner (1984) purposely selected vending machines to use in the multiple-instance instruction that were similar to one another and that did not sample the range of stimulus variations and response requirements that defined the vending machines in the community. After reaching training criterion on three additional machines, Students 4, 5, and 6 were still unable to operate the machines in the community. During the six probe sessions that followed multiple-instance instruction, these students correctly completed only 9 of the 60 total trials.

The researchers then introduced general case instruction in multiple-baseline fashion across students. This condition was the same as multiple-instance instruction except that the three different vending machines

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used in general case training, when combined with the single-instance machine, provided the students with practice across the total range of stimulus conditions and response variations found in vending machines in the community. None of the training machines, however, were exactly the same as any machine used in the generalization probes. After reaching training criterion on the general case machines, all six students showed substantial improvements in their performance on the 10 untrained machines. Sprague and Horner (1984) speculated that Student 3's poor performance on the first generalization probe following general case instruction was caused by a ritualistic pattern of inserting coins that he had developed during previous probe sessions. After receiving repeated practice on the coin insertion step during a training session between Probe Sessions 5 and 6, Student 3's performance on the generalization machines improved greatly.

Negative, or "Don't Do It," Teaching Examples

Generalization across every possible condition or situation is rarely desirable. Teaching a student where and when to use a new skill or bit of knowledge does not mean that he also knows where and when *not* to use this newly learned behavior. Brian, for example, needs to learn that he should not say, "Hello, how are you?" to people that he greeted within the past hour or so. Learners must be taught to discriminate the stimulus conditions that signal when responding is appropriate from stimulus conditions that signal when responding is inappropriate.

Instruction that includes "don't do it" teaching examples intermixed with positive examples provides learners with practice discriminating stimulus situations in which the target behavior should not be emitted (i.e., S^{Δ}s) from those conditions when the behavior is appropriate. This sharpens the stimulus control necessary to master many concepts and skills (Engelmann & Carnine, 1982).[7]

Horner, Eberhard, and Sheehan (1986) incorporated "don't do it" examples into training programs to teach four high school students with moderate to severe mental retardation how to bus tables in cafeteria-style restaurants. To correctly bus a table, the student had to remove all dishes, silverware, and garbage from tabletop, chairs, and the floor under and around the table; wipe the tabletop; straighten chairs; and place dirty dishes and garbage in appropriate receptacles. In addition, the students were taught to inquire, through the use of cards, if a customer was finished with empty dishes. The three settings, one for training and two for generalization probes, differed in terms of size and furniture characteristics and configurations.

Each training trial required the student to attend to the following stimulus features of a table: (a) the presence or absence of people at a table, (b) whether people were eating at the table, (c) the amount and/or status of food on dishes, (d) the presence or absence of garbage at a table, and (e) the location of garbage and/or dirty dishes at a table. Training consisted of 30-minute sessions involving six table types that represented the range of conditions likely to be encountered in a cafeteria-style restaurant. A trainer modeled correct table bussing, verbally prompted correct responding and stopped the student when errors occurred, recreated the situation, and provided additional modeling and assistance. The six training examples consisted of four to-be-bussed tables and two not-to-be-bussed tables (see Table 28.1).

During generalization probe sessions, which were conducted in two restaurants not used for training, each student was presented with 15 tables selected to represent the range of table types the students could be expected to encounter if employed in a cafeteria-style restaurant. The 15 probe tables consisted of 10 to-be-bussed tables and 5 not-to-be-bussed tables. The results showed a functional relation between general case instruction that included not-to-be-bussed tables and "immediate and pronounced improvement in the percentage of probe tables responded to correctly" (p. 467).

Negative teaching examples are necessary when discriminations must be made between appropriate and inappropriate conditions for a particular response. Practitioners should ask this question: Is responding *always appropriate* in the generalization setting(s)? If the answer is no, then "don't do it now" teaching examples should be part of instruction.

Does the teaching setting or situation naturally or automatically include a sufficient number and range of negative examples? The teaching situation must be analyzed to answer this important question. Practitioners may need to contrive some negative teaching examples. *Practitioners should not assume the natural environment will readily reveal sufficient negative examples.* Conducting training in the natural environment is no guarantee that learners will be exposed to stimulus situations that they are likely to encounter in the generalization environment after training. For example, in the study on teaching table bussing described earlier, Horner and colleagues (1986) noted that, "on some days the trainer needed actively to

[7]Teaching examples used to help students discriminate when not to respond (i.e., S^{Δ}s) are sometimes called *negative examples* and contrasted with positive examples (i.e., S^{D}s). However, in our work in teaching this concept, practitioners have told us that the term *negative teaching example* suggests that the teacher is modeling or showing the learner *how* not to perform the target behavior. Instruction on the desired topography for some behaviors may be aided by providing students with models on how not to perform certain behavior (i.e., negative examples), but the function of "don't do it" examples is to help the learner discriminate antecedent conditions that signal an inappropriate occasion for responding.

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Table 28.1 Six Training Examples Used to Teach Students with Disabilities How to Bus Tables in Cafeteria-Style Restaurants

Training Examples	*Presence of People and Possessions*	*People Eating or Not Eating*	*Dishes: Empty/ Part/New Food*	*Garbage: Present or Not Present*	*Location of Garbage and Dishes*	*Correct Response*
1	0 People + possessions	N/A	Partial	Present	Table Chairs	Don't Bus
2	0 People	N/A	Partial	Present	Table, Floor, Chair	Bus
3	2 People	Eating	New food	Present	Table, Chair, Floor	Don't Bus
4	0 People	N/A	Empty	Present	Table, Floor	Bus
5	1 Person	Not eating	Empty	Present	Chair, Floor	Bus
6	2 People	Not eating	Empty	Present	Table	Bus

From "Teaching Generalized Table Bussing: The Importance of Negative Teaching Examples" by R. H. Horner, J. M. Eberhard, and M. R. Sheehan, 1986, *Behavior Modification, 10,* p. 465. Copyright 1986 by the Sage Publications, Inc. Used by permission.

set up one or more table types to ensure that a student had access to a table type that was not 'naturally' available" (p. 464).

"Don't do it" teaching examples should be selected and sequenced according to the degree to which they differ from positive examples (i.e., S^Ds). The most effective negative teaching examples will share many of the relevant characteristics of the positive teaching examples (Horner, Dunlap, & Koegel, 1988). Such *minimum difference negative teaching examples* help the learner to perform the target behavior with the precision required by the natural environment. Minimum difference teaching examples help eliminate "generalization errors" due to overgeneralization and faulty stimulus control. For example, the "don't bus" tables used by Horner and colleagues (1986) shared many features with the "bus" tables (see Table 28.1).

Make the Instructional Setting Similar to the Generalization Setting

> Fresno State coach Pat Hill expects Ohio Stadium to be a new experience for the Bulldogs, who will visit for the first time. For a practice last week in FSU's stadium, Hill hired a production company to blast the Ohio State fight song—at about 90 decibels—throughout the two-hour session. "We created some noise and atmosphere to give us a feel of a live game," Hill said.
>
> —*Columbus Dispatch* (August 27, 2000)

A basic strategy for promoting generalization is to incorporate into the instructional setting stimuli that the learner is likely to encounter in the generalization setting. The greater the similarity between the instructional environment and the generalization environment, the more likely the target behavior will be emitted in the generalization setting. The principle of stimulus generalization states that a behavior is likely to be emitted in the presence of a stimulus very similar to the stimulus conditions in which the behavior was reinforced previously, but the behavior will likely not be emitted under stimulus conditions that differ significantly from the training stimulus.

Stimulus generalization is a relative phenomenon: The more a given stimulus configuration resembles the stimulus conditions present during instruction, the greater the probability that the trained response will be emitted, and vice versa. A generalization setting that differs significantly from the instructional setting may not provide sufficient stimulus control over the target behavior. Such a setting may also contain stimuli that impede the target behavior because their novelty confuses or startles the learner. Exposing the learner to stimuli during instruction that are commonly found in the generalization setting increases the likelihood that those stimuli will acquire some stimulus control over the target behavior and also prepares the learner for the presence of stimuli in the generalization setting that have the potential of impeding performance. Two tactics used by applied behavior analysts to implement this basic strategy are programming common stimuli and teaching loosely.

Program Common Stimuli

Programming common stimuli means including typical features of the generalization setting into the instructional setting. Although behavior analysts have attached a special term to this tactic, successful practitioners in many fields have long used this technique for promoting generalized behavior change. For example, coaches, music teachers, and theater directors hold scrimmages, mock auditions, and dress rehearsals to prepare their athletes, musicians, and actors to perform important skills in settings that include the sights, sounds, materials, people,

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and procedures that simulate as closely as possible those in the "real world."

Van den Pol and colleagues (1981) programmed common stimuli when they taught three young adults with disabilities how to order and eat in fast-food restaurants. The researchers used numerous items and photos from actual restaurants to make the classroom simulate the conditions found in actual restaurants. Plastic signs with pictures and names of various McDonald's sandwiches were posted on the classroom wall, a table was transformed into a mock "counter" for role-playing transactions, and the students practiced responding to 60 photographic slides taken in actual restaurants showing both positive and negative ("don't do it") examples of situations customers are likely to encounter.

Why go to all the trouble of simulating the generalization setting? Why not just conduct instruction in the generalization setting itself to ensure that the learner experiences all of the relevant aspects of the setting? First, conducting instruction in natural settings is not always possible or practical. Lots of resources and time may be necessary to transport students to community-based settings.

Second, community-based training may not expose students to the full range of examples they are likely to encounter later in the same setting. For example, students who receive *in situ* instruction for grocery shopping or street crossing during school hours may not experience the long lines at the checkout counters or heavy traffic patterns typical of evening hours.

Third, instruction in natural settings may be less effective and efficient than classroom instruction because the trainer cannot halt the natural flow of events to contrive an optimal number and sequence of training trials needed (e.g., Neef, Lensbower, Hockersmith, DePalma, & Gray, 1990).

Fourth, instruction in simulated settings can be safer, particularly with target behaviors that must be performed in potentially dangerous environments or that have severe consequences if performed incorrectly (e.g., Miltenberger et al., 2005), or when children or people with learning problems must perform complex procedures. If the procedures involve invading the body or errors during practice are potentially hazardous, simulation training should be used. For example, Neef, Parrish, Hannigan, Page, and Iwata (1990) had children with neurogenic bladder complications practice performing self-catheterization skills on dolls.

Programming common stimuli is a straightforward two-step process of (a) identifying salient stimuli that characterize the generalization setting(s) and (b) incorporating those stimuli into the instructional setting. A practitioner can identify possible stimuli in the generalization setting to make common by direct observation or by asking people familiar with the setting. Practitioners should conduct observations in the generalization setting(s) and write down prominent features of the environment that might be important to include during training. When direct observation is not feasible, practitioners can obtain secondhand knowledge of the setting by interviewing or giving checklists to people who have firsthand knowledge of the generalization setting—those who live, work in, or are otherwise familiar with the generalization setting(s) in question.

If a generalization setting includes important stimuli that cannot be recreated or simulated in the instructional setting, then at least some training trials must be conducted in the generalization setting. However, as pointed out previously, practitioners should not assume that community-based instruction will guarantee students' exposure to all of the important stimuli common to the generalization setting.

Teach Loosely

Applied behavior analysts control and standardize intervention procedures to maximize their direct effects, and so the effects of their interventions can be interpreted and replicated by others. Yet restricting teaching procedures to a "precisely repetitive handful of stimuli or formats may, in fact, correspondingly restrict generalization of the lessons being learned" (Stokes & Baer, 1977, p. 358). To the extent that generalized behavior change can be viewed as the opposite of strict stimulus control and discrimination, one technique for facilitating generalization is to vary as many of the noncritical dimensions of the antecedent stimuli as possible during instruction.

Teaching loosely, randomly varying noncritical aspects of the instructional setting within and across teaching sessions, has two advantages or rationales for promoting generalization. First, teaching loosely reduces the likelihood that a single or small group of noncritical stimuli will acquire exclusive control over the target behavior. A target behavior that inadvertently comes under the control of a stimulus present in the instructional setting but not always present in the generalization setting may not be emitted in the generalization setting. Here are two examples of this type of faulty stimulus control:

- *Following teachers' directions:* A student with a history of receiving reinforcement for complying with teachers' directions when they are given in a loud voice and accompanied by a stern facial expression may not follow directions that do not contain one or both of those noncritical variables. The discriminative stimulus for the student's compliance with teacher directions should be the content of the teacher's statements.

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- *Assembling bicycle sprocket sets:* A new employee at the bicycle factory inadvertently learns to assemble rear sprocket sets by putting a red sprocket on top of a green sprocket and a green sprocket on top of a blue sprocket because the sprocket sets on a particular bicycle model in production on the day she was trained were colored in that fashion. However, proper assembly of a sprocket set has nothing to do with the colors of the individual sprockets; the relevant variable is the relative size of the sprockets (i.e., the biggest sprocket goes on the bottom, the next biggest on top of that one, and so on).

Systematically varying the presence and absence of noncritical stimuli during instruction greatly decreases the chance that a functionally irrelevant factor, such as a teacher's tone of voice or sprocket color in these two examples, will acquire control of the target behavior (Kirby & Bickel, 1988).

A second rationale for loose teaching is that including a wide variety of noncritical stimuli during instruction increases the probability that the generalization setting will include at least some of the stimuli that were present during instruction. In this sense, loose teaching acts as a kind of catchall effort at programming common stimuli and makes it less likely that a student's performance will be impeded or "thrown off" by the presence of a "strange" stimulus.

Loose teaching applied to the previous two examples might entail the following:

- *Following teachers' directions:* During instruction the teacher varies all of the factors mentioned earlier (e.g., tone of voice, facial expression), plus gives directions while standing, while sitting, from different places within the classroom, at different times of the day, while the student is alone and in groups, while looking away from the student, and so on. In each instance, reinforcement is contingent on the student's compliance with the content of the teacher's direction irrespective of the presence or absence of any of the noncritical features.
- *Assembling bicycle sprocket sets:* During training the new employee assembles sprocket sets containing sprockets of widely varying colors, after receiving the component sprockets in varied sequences, when the factory floor is busy, at different times during a work shift, with and without music playing, and so forth. Irrespective of the presence, absence, or values of any of these noncritical factors, reinforcement would be contingent on correct assembly of sprockets by relative size.

Seldom used as a stand-alone tactic, loose teaching is often a recognizable component of interventions when generalization to highly variable and diverse settings or situations is desired. For example, Horner and colleagues (1986) incorporated loose teaching into their training program for table busing by systematically but randomly varying the location of the tables, the number of people at the tables, whether food was completely or partially eaten, the amount and location of garbage, and so forth. Hughes and colleagues (1995) incorporated loose teaching by varying the peer teachers and varying the locations of training sessions. Loose teaching is often a recognizable feature of language training programs that use milieu, incidental, and naturalistic teaching methods (e.g., Charlop-Christy & Carpenter, 2000; McGee, Morrier, & Daly, 1999; Warner, 1992).

Few studies evaluating the effects of using loose teaching in isolation have been reported. One exception is an experiment by Campbell and Stremel-Campbell (1982), who evaluated the effectiveness of loose teaching as a tactic for facilitating the generalization of newly acquired language by two students with moderate mental retardation. The students were taught the correct use of the words *is* and *are* in "wh" questions (e.g., "What are you doing?"), yes/no reversal questions (e.g., "Is this mine?"), and statements (e.g., "These are mine?"). Each student received two 15-minute language training sessions conducted within the context of other instructional activities that were part of each child's individualized education program, one during an academic task and the second during a self-help task. The student could initiate a language interaction based on the wide variety of naturally occurring stimuli, and the teacher could try to evoke a statement or question from the student by intentionally misplacing instructional materials or offering indirect prompts. Generalization probes of the students' language use during two daily 15-minute free-play periods revealed substantial generalization of the language structures acquired during the loose teaching sessions.

The learner's performance of the target behavior should be established under fairly restricted, simplified, and consistent conditions, before much "looseness" is introduced. This is particularly important when teaching complex and difficult skills. Only noncritical (i.e., functionally irrelevant) stimuli should be "loosened." Practitioners should not inadvertently loosen stimuli that reliably function in the generalization setting as discriminative stimuli (S^Ds) or as "don't do it" examples (S^Δs). Stimuli known to play important roles in signaling when and when not to respond should be systematically incorporated into instructional programs as teaching examples. A stimulus condition that may be functionally irrelevant for one skill may be a critical S^D for another skill.

Taking the notion of varying noncritical aspects of the instructional setting and procedures to its logical

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limit, Baer (1999) offered the following advice for loose teaching:

- Use two or more teachers.
- Teach in two or more places.
- Teach from a variety of positions.
- Vary your tone of voice.
- Vary your choice of words.
- Show the stimuli from a variety of angles, using sometimes one hand and sometimes the other.
- Have other persons present sometimes and not other times.
- Dress quite differently on different days.
- Vary the reinforcers.
- Teach sometimes in bright light, sometimes in dim light.
- Teach sometimes in noisy settings, sometimes in quiet ones.
- In any setting, vary the decorations, vary the furniture, and vary their locations.
- Vary the times of day when you and everyone else teach.
- Vary the temperature in the teaching settings.
- Vary the smells in the teaching settings.
- Within the limits possible vary the content of what's being taught.
- Do all of this as often and as unpredictably as possible. (p. 24)

Of course, Baer (1999) was not suggesting that a teacher needs to vary all of these factors for every behavior taught. But building a reasonable degree of "looseness" into teaching is an important element of a teacher's overall effort to program for generalization rather than train and hope.

Maximize Contact with Reinforcement in the Generalization Setting

Even though a practitioner is successful in getting the learner to emit a newly acquired target behavior in a generalization setting with a naturally existing contingency of reinforcement, generalization and maintenance may be short-lived if the behavior makes insufficient contact with reinforcement. In such cases the practitioner's efforts to promote generalization revolves around ensuring that the target behavior contacts reinforcement in the generalization setting. Five of the 13 tactics for promoting generalized behavior change described in this chapter involve some form of arranging or contriving for the target behavior to be reinforced in the generalization setting.

Teach Behavior to Levels Required by Natural Contingencies

Baer (1999) suggested that a common mistake practitioners make when attempting to employ natural contingencies of reinforcement is failing to teach the behavior change well enough so that it contacts the contingency.

> Sometimes behavior changes that seem to need generalization may only need better teaching. Try making the students fluent, and see if they still need further support for generalization. Fluency may consist of any or all of the following: high rate of performance, high accuracy of performance, fast latency, given the opportunity to respond, and strong response. (p. 17)

A new behavior may occur in the generalization setting but fail to make contact with the naturally existing contingencies of reinforcement. Common variables that diminish contact with reinforcement in the generalization setting include the accuracy of the behavior, the dimensional quality of the behavior (i.e., frequency, duration, latency, magnitude), and the form (topography) of the behavior. The practitioner may need to enhance the learner's performance in one or more of these variables to ensure that the new behavior will meet the naturally existing contingencies of reinforcement. For example, when given a worksheet to complete at his desk, a student's behavior that is consistent with the following dimensions is unlikely to contact reinforcement for completing the task, even if the student has the ability to complete each worksheet item accurately.

- *Latency too long.* A student who spends 5 minutes "daydreaming" before he begins reading the directions may not finish in time to obtain reinforcement.
- *Rate too low.* A student who needs 5 minutes to read the directions for an independent seatwork assignment that his peers read in less than 1 minute may not finish in time to obtain reinforcement.
- *Duration too brief.* A student who can work without direct supervision for only 5 minutes at a time will not be able to complete any task requiring more than 5 minutes of independent work.

The solution for this kind of generalization problem, if not always simple, is straightforward. The behavior change must be made more fluent: The learner must be taught to emit the target behavior at a rate commensurate with the naturally occurring contingency, with more

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accuracy, within a shorter latency, and/or at a greater magnitude. Generalization planning should include identification of the levels of performance necessary to access existing criteria for reinforcement.

Program Indiscriminable Contingencies

Applied behavior analysts purposely design and implement interventions so the learner receives consistent and immediate consequences for emitting the target behavior. Although consistent and immediate consequences are often necessary to help the learner acquire new behavior, those very contingencies can impede generalization and maintenance. The clear, predictable, and immediate consequences that are typically part of systematic instruction can actually work against generalized responding. This is most likely to occur when a newly acquired skill has not yet contacted naturally existing contingencies of reinforcement, and the learner can discriminate when the instructional contingencies are absent in the generalization settings. If the presence or absence of the controlling contingencies in the generalization setting is obvious or predictable to the learner ("Hey, the game's off. There's no need to respond here/now"), the learner may stop responding in the generalization setting, and the behavior change the practitioner worked so hard to develop may cease to occur before it can contact the naturally existing contingency of reinforcement.

An **indiscriminable contingency** is one in which the learner cannot discriminate whether the next response will produce reinforcement. As a tactic for promoting generalization and maintenance, programming indiscriminable contingencies involves contriving a contingency in which (a) reinforcement is contingent on some, but not all, occurrences of the target behavior in the generalization setting, and (b) the learner is unable to predict which responses will produce reinforcement.

The basic rationale for programming indiscriminable contingencies is to keep the learner responding often enough and long enough in the generalization setting for the target behavior to make sufficient contact with the naturally existing contingencies of reinforcement. From that point on, the need to program contrived contingencies to promote generalization will be moot. Applied behavior analysts use two related techniques to program indiscriminable contingencies: intermittent schedules of reinforcement and delayed rewards.

Intermittent Schedules of Reinforcement. A newly learned behavior often must occur repeatedly over a period of time in the generalization setting before it contacts a naturally existing contingency of reinforcement. During that time, an extinction condition exists for responses emitted in the generalization setting. The current or most recent schedule of reinforcement for a behavior in the instructional setting plays a significant role in how many responses will be emitted in the generalization setting prior to reinforcement. Behaviors that have been under continuous schedules of reinforcement (CRF) show very limited response maintenance under extinction. When reinforcement is no longer available, responding is likely to decrease rapidly to prereinforcement levels. On the other hand, behaviors with a history of intermittent schedules of reinforcement often continue to be emitted for relatively long periods of time after reinforcement is no longer available (e.g., Dunlap & Johnson, 1985; Hoch, McComas, Thompson, & Paone, 2002).

An experiment by Koegel and Rincover (1977, Experiment II) showed the effects of intermittent schedules of reinforcement on response maintenance in a generalization setting. The participants were six boys diagnosed with autism and severe to profound mental retardation, ages 7 to 12 years, who had participated in a previous study on generalization and had showed generalized responding in the extra-therapy setting used in that experiment (Rincover & Koegel, 1975). As in Experiment I by Koegel and Rincover (1977) described earlier in this chapter, one-on-one training trials were conducted with each child and the trainer seated at a table in a small room, and generalization trials were conducted by an unfamiliar adult standing outside on the lawn, surrounded by trees. Two types of imitative response class consisted of (a) nonverbal imitation (e.g., raising arm) in response to an imitative model and the verbal instruction, "Do this" and (b) touching a body part in response to verbal instructions such as, "Touch your nose." After acquiring an imitation response, each child was given additional trials on one of three randomly chosen schedules of reinforcement: CRF, FR 2, or FR 5. Only after these additional training trials were the children taken outside to assess response maintenance. Once outside, trials were conducted until the child's correct responding had decreased to 0%, or was maintained at 80% correct or above for 100 consecutive trials.

Behaviors that were most recently on a CRF schedule in the instructional setting underwent extinction quickly in the generalization setting (see Figure 28.7). Generalized responding occurred longer for the FR 2 trained behavior, and longer still for behavior that had been shifted to an FR 5 schedule in the instructional setting. The results showed clearly that the schedule of reinforcement in the instructional setting had a predictable effect on responding in the absence of reinforcement in the generalization setting: The thinner the schedule in the instructional setting, the longer the response maintenance in the generalization setting.

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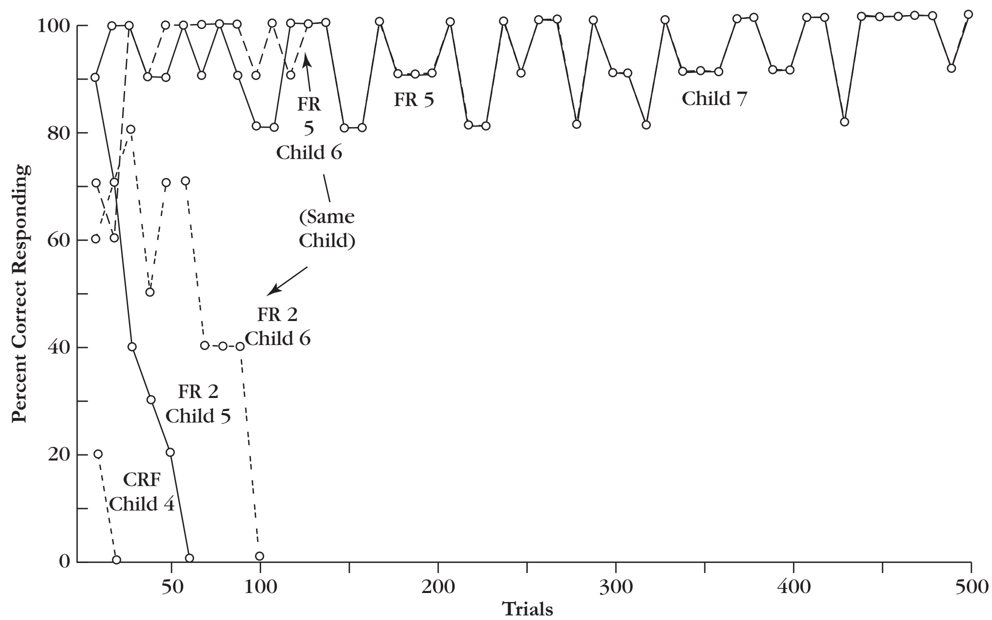

Figure 28.7 Percent of correct responses by three children in a generalization setting as a function of the schedule of reinforcement used during the final sessions in an instructional setting.

From "Research on the Differences between Generalization and Maintenance in Extra-Therapy Responding" by R. L. Koegel and A. Rincover, 1977, *Journal of Applied Behavior Analysis, 10,* p. 8. Copyright 1977 by the Society for the Experimental Analysis of Behavior, Inc. Reprinted by permission.

The defining feature of all intermittent schedules of reinforcement is that only some responses are reinforced, which means, of course, that some responses go unreinforced. Thus, one possible explanation for the maintenance of responding during periods of extinction for behaviors developed under intermittent schedules is the relative difficulty of discriminating that reinforcement is no longer available. Thus, the unpredictability of an intermittent schedule may account for the maintenance of behavior after the schedule is terminated.

Practitioners should recognize that although *all indiscriminable contingencies of reinforcement involve intermittent schedules, not all schedules of intermittent reinforcement are indiscriminable.* For example, although the FR 2 and FR 5 schedules of reinforcement used by Koegel and Rincover (1977) were intermittent, many learners would soon be able to discriminate whether reinforcement would follow their next response. In contrast, a student whose behavior is being supported by a VR 5 schedule of reinforcement cannot determine whether his next response will be reinforced.

Delayed Rewards. Stokes and Baer (1977) suggested that not being able to discriminate in what settings a behavior will be reinforced is similar to not being able to discriminate whether the next response will be reinforced. They cited an experiment by Schwarz and Hawkins (1970) in which each day after school a sixth-grade girl was shown videotapes of her behavior in that day's math class and received praise and token reinforcement for improvements in her posture, reducing the number of times she touched her face, and speaking with sufficient volume to be heard by others. Reinforcement after school was contingent on behaviors emitted during math class only, but comparable improvements were noted in spelling class as well. The generalization data were taken from videotapes that were made of the girl's behavior in spelling class but were never shown to her. Stokes and Baer hypothesized that because reinforcement was delayed (the behaviors that produced praise and tokens were emitted during math class but were not rewarded until after school), it may have been difficult for the student to discriminate when improved performance was required for reinforcement. They suggested that the generalization across settings of the target behaviors may have been a result of the indiscriminable nature of the response-to-reinforcement delay.

Delayed rewards and intermittent schedules of reinforcement are alike in two ways: (a) Reinforcement is not delivered each time the target behavior is emitted (only some responses are followed by reinforcement), and (b) there are no clear stimuli to signal the learner which current responses will produce reinforcement. A delayed reward contingency differs from intermittent reinforcement in that instead of delivering the consequence immediately following an occurrence of the target behavior, the reward is provided after a period of time has elapsed (i.e., a response-to-reward delay). Receiving the

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delayed reward is contingent on the learner having performed the target behavior in the generalization setting *during an earlier time period.* With an effective delayed reward contingency, the learner cannot discriminate when (or where, depending on the details of the contingency) the target behavior must be emitted in order to receive reinforcement. As a result, to have the best chance to receive the reward later, the learner must "be good all day" (Fowler & Baer, 1981).

Two similar studies by Freeland and Noell (1999, 2002) investigated the effects of delayed rewards on the maintenance of students' mathematics performance. Participants in the second study were two third-grade girls who had been referred by their teacher for help with mathematics. That target behavior for both students was writing answers to single-digit addition problems with sums to 18. The researchers used a multiple-treatment reversal design to compare the effects of five conditions on the number of correct digits written as answers to single-digit addition problems during daily 5-minute work periods (e.g., writing "11" as the answer to "5 + 6 = ?" counted as two digits correct).

- *Baseline:* Green worksheets; no programmed consequences; students were told they could attempt as many or as few problems as they wanted.
- *Reinforcement:* Blue worksheets with a goal number at the top indicating the number of correct digits needed to choose a reward in the "goody box"; each student's goal number was the median number of correct digits on the last three worksheets; all worksheets were graded after each session.
- *Delay 2:* White worksheets with goal number; after every two sessions, one of the two worksheets completed by each student was randomly selected for grading; reinforcement was contingent on meeting highest median of three consecutive sessions up to that point in the study.
- *Delay 4:* White worksheets with goal number and same procedures as Delay 2 except that worksheets were not graded until four sessions had been completed, at which time one of each student's previous four worksheets was randomly selected and graded.
- *Maintenance:* White worksheets with goal number as before; no worksheets were graded and no feedback or rewards for performance were given.

The fact that different colored worksheets were used for each condition in this study made it easy for the students to predict the likelihood of reinforcement. A green worksheet meant no "goody bag"—and no feedback at all—no matter how many correct digits were written. However, meeting one's performance criterion on a white worksheet sometimes produced reinforcement. This study provides powerful evidence of the importance of having contingencies in the instructional setting "look like" the contingencies in effect in the generalization setting(s) in two ways: (a) Both students showed large decreases in performance when baseline conditions were reinstated, and immediate drops during a second return to baseline; and (b) the students continued completing math problems at a high rate during the maintenance condition, even though no reinforcement was provided. (See Figure 28.8.)

When the delayed (indiscriminable) contingencies were implemented, all students demonstrated levels of correct responding at or above levels during the reinforcement phase. When the students were exposed to maintenance conditions, Amy maintained high levels of responding for 18 sessions with variable performance over the final six sessions, and Kristen showed a gradually increasing rate of performance over 24 sessions. The results demonstrated that behavior with an indiscriminable contingency can be maintained at the same rate as with a predictable schedule, and with greater resistance to extinction.

Delayed consequences have been used to promote the setting/situation generalization and response maintenance of a wide range of target behaviors, including academic and vocational tasks by individuals with autism (Dunlap, Koegel, Johnson, & O'Neill, 1987), young children's toy play, social initiations, and selection of healthy snacks (R. A. Baer, Blount, Dietrich, & Stokes, 1987; R. A. Baer, Williams, Osnes, & Stokes, 1984; Osnes, Guevremont, & Stokes, 1986), restaurant trainees' responding appropriately to coworkers' initiations (Grossi et al., 1994); and performance on reading and writing tasks (Brame, 2001; Heward, Heron, Gardner, & Prayzer, 1991).

The effective use of delayed consequences can reduce (or even eliminate in some instances) the learner's ability to discriminate when a contingency is or is not in effect. As a result, the learner needs to "be good" (i.e., emit the target behavior) all the time. If an effective contingency can be made indiscriminable across settings and target behaviors, the learner will also have to "be good" everywhere, with all of his or her relevant skills.

Following are four examples of classroom applications of indiscriminable contingencies involving delayed rewards. Each of these examples also features an interdependent group contingency (see Chapter 26) by making rewards for the whole class contingent on the performance of randomly selected students.

- *Spinners and dice.* A procedure such as the following can make academic seatwork periods more effective. Every few minutes (e.g., on a VI 5-minute

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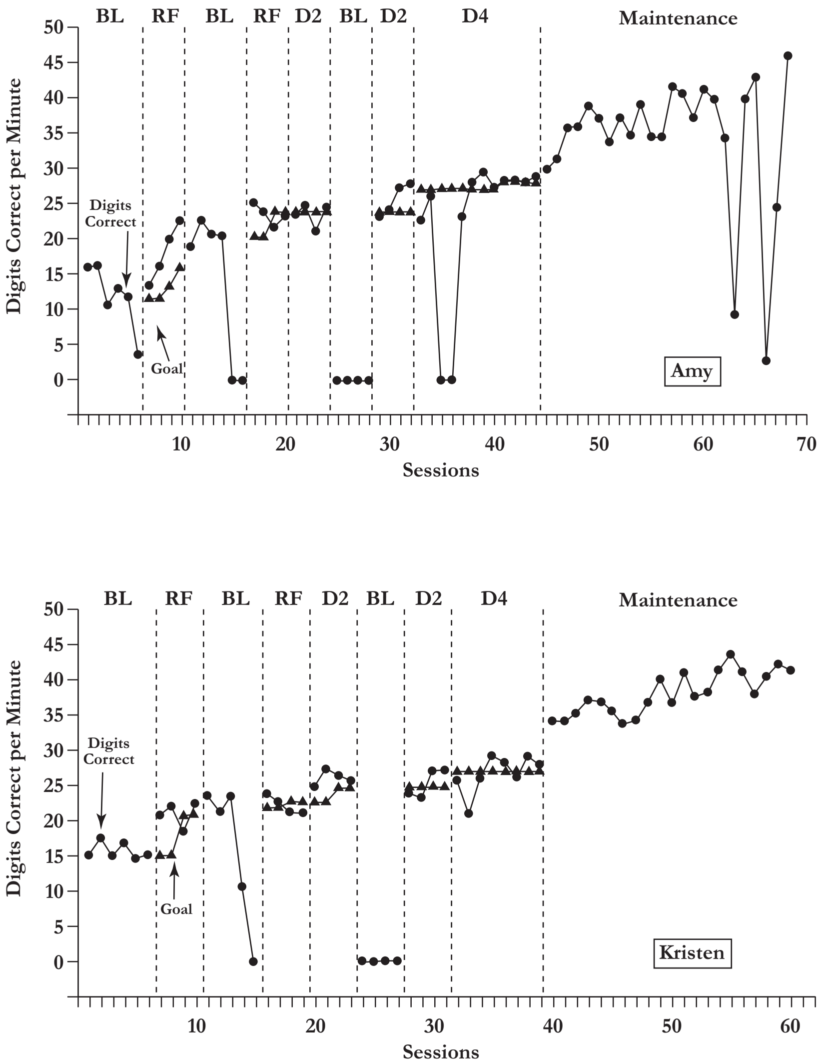

Figure 28.8 Number of correct digits per minute by two third-grade students while answering math problems during baseline (BL), reinforcement contingent on performance on one randomly selected worksheet after each session (RF), reinforcement contingent on performance on one randomly selected worksheet after every two (D2) or four (D4) sessions, and maintenance conditions.

From "Programming for Maintenance: An Investigation of Delayed Intermittent Reinforcement and Common Stimuli to Create Indiscriminable Contingencies" by J. T. Freeland and G. H. Noell, 2002, *Journal of Behavioral Education, 11,* p. 13. Copyright 2002 by Human Sciences Press. Reprinted by permission.

schedule), the teacher (a) randomly selects a student's name, (b) walks to that student's desk and has the student spin a spinner or roll a pair of dice, (c) counts backward from the worksheet problem or item the student is currently working on by the number shown on the spinner or dice, and (d) gives a token to the student if that problem or item is correct. Students who immediately begin to work on the assignment and work quickly but carefully throughout the seatwork period are most likely to obtain reinforcers under this indiscriminable contingency.

- *Story fact recall game.* Many teachers devote 20 to 30 minutes per day to sustained silent reading (SSR), a period when students can read silently from books of their choice. A story fact recall game can encourage students to read with a purpose during SSR. At the end of the SSR period the teacher asks several randomly selected students a question about the book they are reading. For example, a student who is reading Chapter 3 of Elizabeth Winthrop's *The Castle in the Attic* might be asked, What did William give the Silver Knight to eat? (Answer: bacon and toast). A correct answer is praised by the teacher, applauded by the class, and earns a marble in a jar toward a reward for the whole class. Students do not know when they will be called on or what they might be asked (Brame, Bicard, Heward, & Greulich, 2007).
- *Numbered heads together.* Collaborative learning groups (small groups of students working together on a joint learning activity) can be effective, but teachers should use procedures that motivate all students to participate. A technique called numbered heads together can ensure that all students actively participate (Maheady, Mallete, Harper, & Saca, 1991). Students are seated in heterogeneous groups of three or four, and each student is given the number 1, 2, 3, or 4. The teacher asks the class a question, and each group discusses the problem

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and comes up with an answer. Next, the teacher randomly selects a number from 1 to 4 and then calls on one or more students with that number to answer. It is important that every person in the group knows the answer to the question. This strategy promotes cooperation within the group rather than competition. Because all students must know the answer, group members help each other understand not only the answer, but also the how and why behind it. Finally, this strategy encourages individual responsibility.

- *Intermittent grading.* Most students do not receive sufficient practice writing, and when students do write, the feedback they receive is often ineffective. One reason for this may be that providing detailed feedback on a daily composition by each student in the class requires more time and effort than even the most dedicated teacher can give. A procedure called intermittent grading offers one solution to this problem (Heward, Heron, Gardner, & Prayzer, 1991). Students write for 10 to 15 minutes each day, but instead of reading and evaluating every student's paper, the teacher provides detailed feedback on a randomly selected 20 to 25% of students' daily compositions. The students whose papers were graded earn points based on individualized performance criteria, and bonus points are given to the class contingent on the quality of the selected and graded papers (e.g., if the authors of four of the five papers that were graded met their individual criteria). Students' papers that were graded can be used as a source of instructional examples for the next lesson.

The success of a delayed reward tactic in promoting generalization and maintenance rests on (a) the indiscriminability of the contingency (i.e., the learner cannot tell exactly when emitting the target behavior in the generalization setting will produce a reward at a later time), and (b) the learner understanding the relation between his emitting the target behavior at an earlier time and receiving a reward later. A delayed rewards intervention may not be effective with some learners with severe cognitive disabilities.

Guidelines for Programming Indiscriminable Contingencies. Practioners should consider these guidelines when implementing indiscriminable contingencies:

- Use continuous reinforcement during the initial stages of acquiring new behaviors or when strengthening little-used behaviors.
- Systematically thin the schedule of reinforcement based on the learner's performance (see Chapter 13). Remember that the thinner the schedule of reinforcement is, the more indiscriminable it is (e.g., an FR 5 schedule is more indiscriminable than an FR 2 schedule); and variable schedules of reinforcement (e.g., VR and VI schedules) are more indiscriminable than fixed schedules are (e.g., FR and FI schedules).
- When using delayed rewards, begin by delivering the reinforcer immediately following the target behavior and gradually increase the response-to-reinforcement delay.
- Each time a delayed reward is delivered, explain to the learner that he is receiving the reward for specific behaviors he performed earlier. This helps to build and strengthen the learner's understanding of the rule describing the contingency.

When selecting reinforcers to use during instruction, practitioners should try to use or eventually shift to the same reinforcers that the learner will acquire in the generalization environment. The reinforcer itself may serve as a discriminative stimulus for the target behavior (e.g., Koegel & Rincover, 1977)

Set Behavior Traps

Some contingencies of reinforcement are especially powerful, producing substantial and long-lasting behavior changes. Baer and Wolf (1970) called such contingencies **behavior traps.** Using a mouse trap as an analogy, they described how a householder has only to exert a relatively small amount of behavioral control over the mouse—getting the mouse to smell the cheese—to produce a behavior change with considerable (in this case, complete) generalization and maintenance.

> A householder without a trap can, of course, still kill a mouse. He can wait patiently outside the mouse's hole, grab the mouse faster than the mouse can avoid him, and then apply various forms of force to the unfortunate animal to accomplish the behavioral change desired. But this performance requires a great deal of competence: vast patience, super-coordination, extreme manual dexterity, and a well-suppressed squeamishness. By contrast, a householder with a trap need very few accomplishments: If he can merely apply the cheese and then leave the trap where the mouse is likely to smell that cheese, in effect he has guaranteed general(ized) change in the mouse's future behavior.
>
> The essence of a trap, in behavioral terms, is that *only a relatively simple response is necessary to enter the trap, yet once entered, the trap cannot be resisted in creating general behavior change.* For the mouse, the entry response is merely to smell the cheese. Everything

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> proceeds from there almost automatically. (p. 321, emphasis added)

Behavioral trapping is a fairly common phenomenon that everyone experiences from time to time. Behavior traps are particularly evident in the activities we "just cannot get (or do) enough of." The most effective behavior traps share four essential features: (a) They are "baited" with virtually irresistible reinforcers that "lure" the student to the trap; (b) only a low-effort response already in the student's repertoire is necessary to enter the trap; (c) interrelated contingencies of reinforcement inside the trap motivate the student to acquire, extend, and maintain targeted academic and/or social skills (Kohler & Greenwood, 1986); and (d) they can remain effective for a long time because students show few, if any, satiation effects.

Consider the case of the "reluctant bowler." A young man is persuaded to fill in as a substitute for a friend's bowling team. He has always regarded bowling as uncool. And bowling looks so easy on television that he does not see how it can be considered a real sport. Nevertheless, he agrees to go, just to help out this one time. During the evening he learns that bowling is not as easy as he had always assumed (he has a history of reinforcement for athletic challenges) and that several people he would like to get to know are avid bowlers (i.e., it is a mixed doubles league). Within a week he has purchased a custom-fitted bowling ball, a bag, and shoes; practiced twice on his own; and signed up for the next league season.

The reluctant bowler example illustrates the fundamental nature of behavior traps: easy to enter and difficult to exit. Some naturally existing behavior traps can lead to maladaptive behaviors, such as alcoholism, drug addiction, and juvenile delinquency. The everyday term *vicious circle* refers to the natural contingencies of reinforcement that operate in destructive behavior traps. Practitioners, however, can learn to create behavior traps that help students develop positive, constructive knowledge and skills. Alber and Heward (1996), who provided guidelines for creating successful traps, gave the following example of an elementary teacher creating a behavior trap that took advantage of a student's penchant for playing with baseball cards.

> Like many fifth graders struggling with reading and math, Carlos experiences school as tedious and unrewarding. With few friends of his own, Carlos finds that even recess offers little reprieve. But he does find solace in his baseball cards, often studying, sorting and playing with them in class. His teacher, Ms. Greene, long ago lost count of the number of times she had to stop an instructional activity to separate Carlos and his beloved baseball cards. Then one day, when she approached Carlos' desk to confiscate his cards in the middle of a lesson on alphabetization, Ms. Greene discovered that Carlos had already alphabetized all the left-handed pitchers in the National League! Ms. Greene realized she'd found the secret to sparking Carlos' academic development.
>
> Carlos was both astonished and thrilled to learn that Ms. Greene not only let him keep his baseball cards at his desk, but also encouraged him to "play with them" during class. Before long, Ms. Greene had incorporated baseball cards into learning activities across the curriculum. In math, Carlos calculated batting averages; in geography, he located the hometown of every major leaguer born in his state; and in language arts, he wrote letters to his favorite players requesting an autographed photo. Carlos began to make significant gains academically and an improvement in his attitude about school was also apparent.
>
> But school became really fun for Carlos when some of his classmates began to take an interest in his knowledge of baseball cards and all the wonderful things you could do with them. Ms. Greene helped Carlos form a classroom Baseball Card Club, giving him and his new friends opportunities to develop and practice new social skills as they responded to their teacher's challenge to think of new ways to integrate the cards into the curriculum. (p. 285)

Ask People in the Generalization Setting to Reinforce the Behavior

> The problem may be simply that the natural community [of reinforcement] is asleep and needs to be awakened and turned on.
>
> —Donald M. Baer (1999, p. 16).

Sometimes a potentially effective contingency of reinforcement in the generalization setting is not operating in a form available to the learner no matter how often or well she performs the target behavior. The contingency is there, but dormant. One solution for this kind of problem is to inform key people in the generalization setting of the value and importance of their attention to the learner's efforts to acquire and use new skills and ask them to help.

For example, a special education teacher who has been helping a student learn how to participate in class discussions by providing repeated opportunities for practice and feedback in the resource room could inform the teachers in the general education classes that the student attends about the behavior change program and ask them to look for and reinforce any reasonable effort by the student to participate in their classrooms. A small amount of contingent attention and praise from these teachers may be all that is needed to achieve the desired generalization of the new skill.

This simple but often effective technique for promoting generalized behavior was evident in the study by Stokes and colleagues (1974) in which staff members responded to the children's waving response by saying,

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"Hello, (name)." Approximately 20 such generalization probes were conducted each day with each child.

Williams, Donley, and Keller (2000) gave mothers of two preschool children with autism explicit instructions on providing models, response prompts, and reinforcement to their children who were learning to ask questions about hidden objects (e.g., "What's that?", "Can I see it?").

Contingent praise and attention from significant others can add to the effectiveness of other strategies already in place in the generalization environment. Broden, Hall, and Mitts (1971) showed this in the self-monitoring study described in Chapter 27. After self-recording had improved eighth-grader Liza's study behavior during history class, the researchers asked Liza's teacher to praise Liza for study behavior whenever he could during history class. Liza's level of study behavior during this Self-Recording Plus Praise condition increased to a mean of 88% and was maintained at levels nearly as high during a subsequent Praise Only condition (see Figure 27.3).

Teach the Learner to Recruit Reinforcement

Another way to "wake up" a potentially powerful but dormant natural contingency of reinforcement is to teach the learner to recruit reinforcement from significant others. For example, Seymour and Stokes (1976) taught delinquent girls to work more productively in the vocational training area of a residential institution. However, observation showed that staff at the institution gave the girls no praise or positive interaction regardless of the quality of their work. The much-needed natural community of reinforcement to ensure the generalization of the girls' improved work behaviors was not functioning. To get around this difficulty, the experimenters trained the girls to use a simple response that called the attention of staff members to their work. With this strategy, staff praise for good work increased. Thus, teaching the girls an additional response that could be used to recruit reinforcement enabled the target behavior to come into contact with natural reinforcers that would serve to extend and maintain the desired behavior change.

Students of various ages and abilities have learned to recruit teacher and peer attention for performing a wide range of tasks in classroom and community settings; preschoolers with developmental delays for completing pre-academic tasks and staying on task during transitions (Connell, Carta, & Baer, 1993; Stokes, Fowler, & Baer, 1978) as well as students with learning disabilities (Alber, Heward, & Hippler, 1999; Wolford, Alber, & Heward, 2001), students with behavioral disorders (Morgan, Young, & Goldstein, 1983), students with mental retardation performing academic tasks in regular classrooms (Craft, Alber, & Heward, 1998), and secondary students with mental retardation for improved work performance in vocational training settings (Mank & Horner, 1987).

Craft and colleagues (1998) assessed the effects of recruitment training on academic assignments for which students recruited teacher attention. Four elementary students were trained by their special education teacher (the first author) when, how, and how often to recruit teacher attention in the general education classroom. Training consisted of modeling, role-playing, error correction, and praise in the special education classroom. The students were taught to show their work to the teacher or ask for help two to three times per work page, and to use appropriate statements such as "How am I doing?" or "Does this look right?"

Data on the frequency of student recruiting and teacher praise statements were collected during a daily 20-minute homeroom period in a general education classroom. During this period, the general education students completed a variety of independent seatwork tasks (reading, language arts, math) assigned by the general education teacher, while the four special education students completed spelling worksheets assigned by the special education teacher, an arrangement that had been established prior to the experiment. If students needed help with their assignments during homeroom, they took their work to the teacher's desk and asked for help.

The effects of recruitment training on the children's frequency of recruiting and on the number of praise statements they received from the classroom teacher are shown in Figure 28.9. Recruiting across students increased from a mean rate of 0.01 to 0.8 recruiting responses per 20-minute session during baseline to a mean rate of 1.8 to 2.7 after training. Teacher praise statements received by the students increased from a mean rate of 0.1 to 0.8 praise statements per session during baseline to a mean rate of 1.0 to 1.7 after training. The ultimate meaning and outcome of the intervention was in the increased amount and improved accuracy of all four of the students' academic work (see Figure 6.9).

For a review of research on recruiting and suggestions for teaching children to recruit reinforcement from significant others, see Alber and Heward (2000). Box 28.2, "Look, Teacher, I'm All Finished!" provides suggestions for teaching students to recruit teacher attention.

Mediate Generalization

Another strategy for promoting generalized behavior change is to arrange for some thing or person to act as a medium that ensures the transfer of the target behavior from the instructional setting to the generalization setting.

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Box 28.2
"Look, Teacher, I'm All Finished!" Teaching Students to Recruit Teacher Attention

Classrooms are extremely busy places, and even the most conscientious teachers can easily overlook students' important academic and social behaviors. Research shows that teachers are more likely to pay attention to a disruptive student than to one who is working quietly and productively (Walker, 1997). It is hard for teachers to be aware of students who need help, especially low-achieving students who are less likely to ask for help (Newman & Golding, 1990).

Although teachers in general education classrooms are expected to adapt instruction to serve students with disabilities, this is not always the case. Most secondary teachers interviewed by Schumm and colleagues (1995) believed that students with disabilities should take responsibility for obtaining the help they need. Thus, knowing how to politely recruit teacher attention and assistance can help students with disabilities function more independently and actively influence the quality of instruction they receive.

Who Should Be Taught to Recruit?

Although most students would probably benefit from learning to recruit teacher praise and feedback, here are some ideal candidates for recruitment training:

Withdrawn Willamena. Willamena seldom asks a teacher anything. Because she is so quiet and well behaved, her teachers sometimes forget she's in the room.

In-a-Hurry Harry. Harry is usually half-done with a task before his teacher finishes explaining it. Racing through his work allows him to be the first to turn it in. But his work is often incomplete and filled with errors, so he doesn't hear much praise from his teacher. Harry would benefit from recruitment training that includes self-checking and self-correction.

Shouting Shelly. Shelly has just finished her work, and she wants her teacher to look at it—right now! But Shelly doesn't raise her hand. She gets her teacher's attention—and disrupts most of her classmates—by shouting across the room. Shelly should be taught appropriate ways to solicit teacher attention.

Pestering Pete. Pete always raises his hand, waits quietly for his teacher to come to his desk, and then politely asks, "Have I done this right?" But he repeats this routine a dozen or more times in a 20-minute period, and his teachers find it annoying. Positive teacher attention often turns into reprimands. Recruitment training for Pete will teach him to limit the number of times he cues his teachers for attention.

How to Get Started

1. *Identify target behaviors.* Students should recruit teacher attention for target behaviors that are valued and therefore likely to be reinforced, such as writing neatly and legibly, working accurately, completing assigned work, cleaning up at transitions, and making contributions when working in a cooperative group.
2. *Teach self-assessment.* Students should self-assess their work before recruiting teacher attention (e.g., Sue asks herself, "Is my work complete?"). After the student can reliably distinguish between complete and incomplete work samples, she can learn how to check the accuracy of her work with answer keys or checklists of the steps or components of the academic skill, or how to spot-check two or three items before asking the teacher to look at it.
3. *Teach appropriate recruiting.* Teach students when, how, and how often to recruit and how to respond to the teacher after receiving attention.
   - *When?* Students should signal for teacher attention after they have completed and self-checked a substantial part of their work. Students should also be taught when not to try to get their teacher's attention (e.g., when the teacher is working with another student, talking to another adult, or taking the lunch count).
   - *How?* The traditional hand raise should be part of every student's recruiting repertoire. Other methods of gaining attention should be taught depending on teacher preferences and routines in the general education classroom (e.g., have students signal they need help by standing up a small flag on their desks; expect students to bring their work to the teacher's desk for help and feedback).
   - *How often?* While helping Withdrawn Willamena learn to seek teacher attention, don't turn her into a Pestering Pete. How often a student should recruit varies across teachers and activities (e.g., independent seatwork, cooperative

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learning groups, whole-class instruction). Direct observation in the classroom is the best way to establish an optimal rate of recruiting; it is also a good idea to ask the regular classroom teacher when, how, and with what frequency she prefers students to ask for help.

- *What to say?* Students should be taught several statements that are likely to evoke positive feedback from the teacher (e.g., "Please look at my work." "Did I do a good job?" "How am I doing?"). Keep it simple, but teach the student to vary her verbal cues so she will not sound like a parrot.
- *How to respond?* Students should respond to their teacher's feedback by establishing eye contact, smiling, and saying, "Thank you." Polite appreciation is very reinforcing to teachers and will increase the likelihood of more positive attention the next time.

4. *Model and role-play the complete sequence.* Begin by providing students with a rationale for recruiting (e.g., the teacher will be happy you did a good job, you will get more work done, your grades might improve). Thinking aloud while modeling is a good way to show the recruiting sequence. While performing each step, say, "Okay, I've finished my work. Now I'm going to check it. Did I put my name on my paper? Yes. Did I do all the problems? Yes. Did I follow all the steps? Yes. Okay, my teacher doesn't look busy right now. I'll raise my hand and wait quietly until she comes to my desk." Have another student pretend to be the regular classroom teacher and come over to you when you have your hand up. Say, "Mr. Patterson, please look at my work." The helper says, "Oh, you did a very nice job." Then smile and say, "Thank you, Mr. Patterson." Role-play with praise and offer corrective feedback until the student correctly performs the entire sequence on several consecutive trials.

5. *Prepare students for alternate responses.* Of course, not every recruiting student attempt will result in teacher praise; some recruiting responses may even be followed by criticism (e.g., "This is all wrong. Pay better attention the next time."). Use role-playing to prepare students for these possibilities and have them practice polite responses (e.g., "Thank you for helping me with this").

6. *Promote generalization to the regular classroom.* The success of any recruitment training effort depends on the student actually using his or her new skill in the regular classroom.

Adapted from "Recruit it or lose it! Training students to recruit contingent teacher attention" by S. R. Alber and W. L. Heward, 1997, *Intervention in School and Clinic, 5,* pp. 275–282. Used with permission.

Two tactics for implementing this strategy are contriving a mediating stimulus and teaching the learner to mediate her own generalization through self-management.

Contrive a Mediating Stimulus

One tactic for mediating generalization is to bring the target behavior under the control of a stimulus in the instructional setting that will function in the generalization setting to reliably prompt or aid the learner's performance of the target behavior. The stimulus selected for this important role may exist already in the generalization environment, or it may be a new stimulus added to the instruction program that subsequently goes with the learner to the generalization setting. Whether it is a naturally existing component of the generalization setting or an added element to the instructional setting, to effectively mediate generalization, a **contrived mediating stimulus** must be (a) made functional for the target behavior during instruction and (b) transported easily to the generalization setting (Baer, 1999). The mediating stimulus is *functional* for the learner if it reliably prompts or aids the learner in performing the target behavior; the mediating stimulus is *transportable* if it easily goes with the learner to all important generalization settings.

Naturally existing features of generalization settings that are used as contrived mediating stimuli may be physical objects or people. Van den Pol and colleagues (1981) used paper napkins, a common feature of any fast-food restaurant, as a contrived mediating stimulus. They taught students that a paper napkin was the only place to put food. In this way, the researchers eliminated the added challenge and difficulty of teaching the students to discriminate clean tables from dirty tables, to sit only at clean tables, or to wipe dirty tables and then programming the generalization and maintenance of those behaviors. By contriving the special use of the napkin, only one response had to be trained, and napkins then served as mediating stimulus for that behavior.

When choosing a stimulus to be made common to both teaching and social generalization setting(s), practitioners should consider using people. In addition to being a requisite feature of social settings, people are transportable and important sources of reinforcement for

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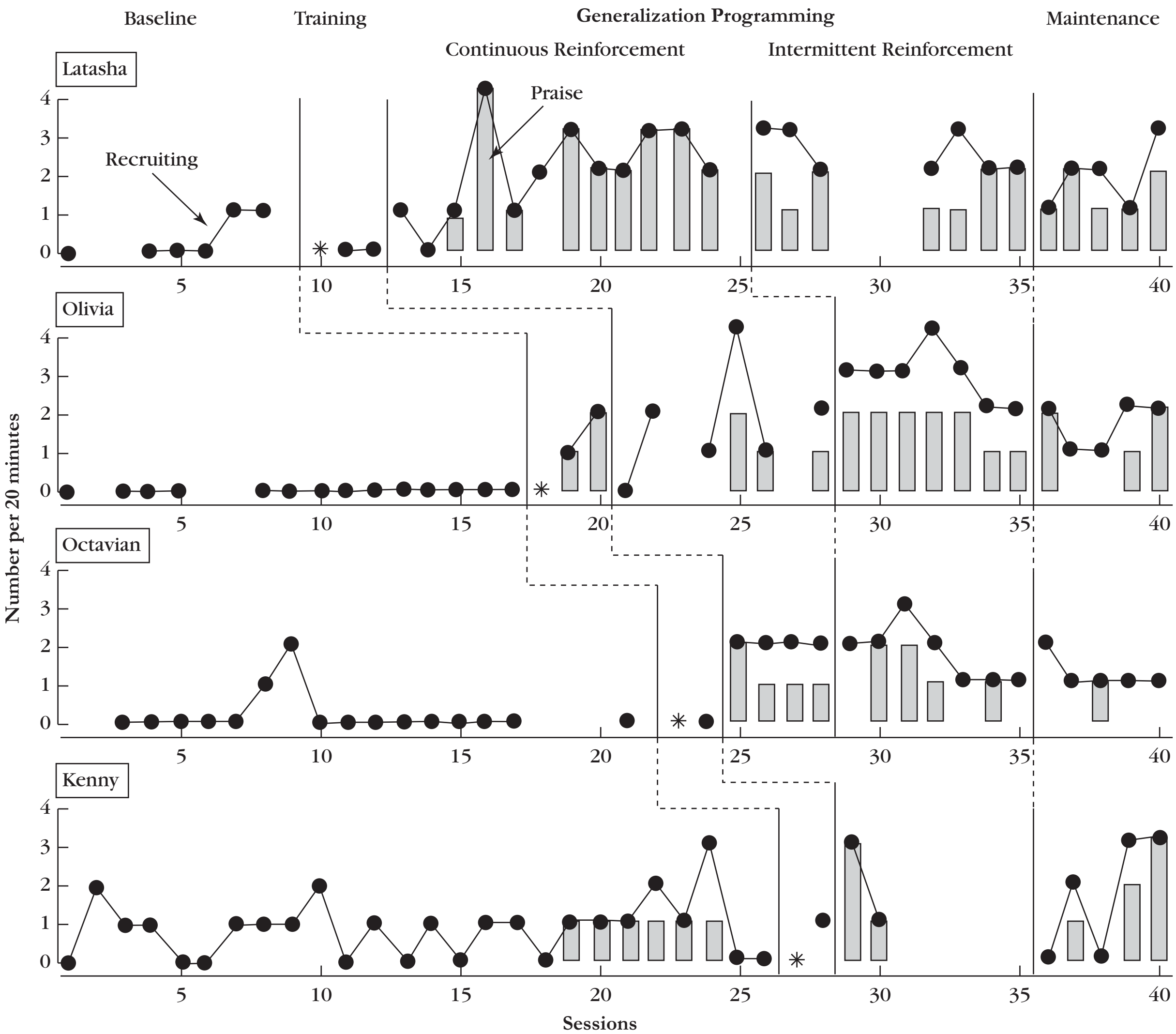

Figure 28.9 Number of recruiting responses (data points) and teacher praise statement (bars) per 20-minute seatwork sessions. Target recruiting rate was two to three responses per session. Asterisks indicate when each student was trained in the resource room.

From "Teaching Elementary Students with Developmental Disabilities to Recruit Teacher Attention in a General Education Classroom: Effects on Teacher Praise and Academic Productivity" by M. A. Craft, S. R. Alber, and W. L. Heward, 1998, *Journal of Applied Behavior Analysis, 31,* p. 407. Copyright 1998 by the Society for the Experimental Analysis of Behavior, Inc. Reprinted by permission.

many behaviors. A study by Stokes and Baer (1976) is a good example of the potential effects of the evocative effects of the presence of a person in the generalization setting who had a functional role in the learner's acquisition of the target behavior in the instructional setting. Two preschool children with learning disabilities learned word-recognition skills while working as reciprocal peer tutors for one another. However, neither child showed reliable generalization of those new skills in nontraining settings until the peer with whom he had learned the skills was present in the generalization setting.

Some contrived mediating stimuli serve as much more than response prompts; they are prosthetic devices that assist the learner in performing the target behavior. Such devices can be especially useful in promoting generalization and maintenance of complex behaviors and extend response chains by simplifying a complex situation. Three common forms are cue cards, photographic activity schedules, and self-operated prompting devices.

Sprague and Horner (1984) gave the students in their study cue cards to aid them in operating a vending machine without another person's assistance. The cue cards, which had food and drink logos on one side and pictures of quarters paired with prices on the other, not only were used during instruction and generalization probes, but also were kept by the students at the end of the program. A follow-up 18 months after the study was completed revealed that five of the six students still carried a cue card and were using vending machines independently.

MacDuff, Krantz, and McClannahan (1993) taught four boys with autism ages 9 to 14 to use photographic activity schedules when performing domestic-living skills such as vacuuming and table setting and for leisure activities such as using manipulative toys. Prior to training with photographic activity schedules, the boys

> were dependent on ongoing supervision and verbal prompts to complete self-help, housekeeping, and leisure activities. . . . In the absence of verbal prompts from supervising adults, it appeared that stimulus control transferred to photographs and materials that were available in the group home. When the study ended, all 4 boys were able to display complex home-living and recreational repertoires for an hour, during which time they frequently changed tasks and moved to different areas of their group home without adults' prompts. Photographic activity schedules, . . . became functional discriminative stimuli that promoted sustained engagement after training ceased and fostered generalized responding to new activity sequences and novel leisure materials. (pp. 90, 97)

Numerous studies have shown that learners across a wide range of age and cognitive levels, including students with severe intellectual disabilities, can learn to use personal audio playback devices to independently perform a variety of academic, vocational, and domestic tasks (e.g., Briggs et al., 1990; Davis, Brady, Williams, & Burta, 1992; Grossi, 1998; Mechling & Gast, 1997; Post, Storey, & Karabin, 2002; Trask-Tyler, Grossi, & Heward, 1994). The popularity of personal music devices such as "Walkman-style" tape players and iPods enables a person to listen to a series of self-delivered response prompts in a private, normalized manner that does not impose on or bother others.

Teach Self-Management Skills

The most potentially effective approach to mediating generalized behavior changes rests with the one element that is always present in every instructional and generalization setting—the learner herself. Chapter 27 described a variety of self-management tactics that people can use to modify their own behavior. The logic of using self-management to mediate generalized behavior changes goes like this: If the learner can be taught a behavior (not the original target behavior, but another behavior—a controlling response from a self-management perspective) that serves to prompt or reinforce the target behavior in all the relevant settings, at all appropriate times, and in all of its relevant forms, then the generalization of the target behavior is ensured. But as Baer and Fowler (1984) warned:

> Giving a student self-control responses designed to mediate the generalization of some critical behavior changes does not ensure that those mediating responses will indeed be used. They are, after all, just responses: they, too, need generalization and maintenance just as do the behavior changes that they are meant to generalize and maintain. Setting up one behavior to mediate the generalization of another behavior may succeed—but it may also represent a problem in guaranteeing the generalization of two responses, where before we had only the problem of guaranteeing the generalization of one! (p. 149)

Train to Generalize

> If generalization is considered as a response itself, then a reinforcement contingency may be placed on it, the same as with any other operant.
>
> —Stokes and Baer (1977, p. 362)

Training "to generalize" was one of the eight proactive strategies for programming generalized behavior change in Stokes and Baer's (1977) conceptual scheme (which also included the nonstrategy, train and hope). The quotation marks around "to generalize" signified that the authors were hypothesizing about the possibilities of treating "to generalize" as an operant response and that they recognized "the preference of behaviorists to consider generalization to be an outcome of behavioral change, rather than as a behavior itself" (p. 363). Since the publication of Stokes and Baer's review, basic and applied research has demonstrated the pragmatic value of their hypothesis (e.g., Neuringer, 1993, 2004; Ross & Neuringer, 2002; Shahan & Chase, 2002). Two tactics that applied behavior analysts have used are reinforcing response variability and instructing the learner to generalize.

Reinforce Response Variability

Response variability can help a person solve problems. A person who can improvise by emitting a variety of responses is more likely to solve problems encountered when a standard response form fails to obtain reinforcement (e.g., Arnesen, 2000; Marckel, Neef, & Ferreri, 2006; Miller & Neuringer, 2000; Shahan & Chase, 2002). Response variability also may result in behavior that is valued because it is novel or creative (e.g., Goetz & Baer, 1973; Holman, Goetz, & Baer, 1977; Pryor, Haag, and O'Reilly, 1969). Response variability may expose a person to sources of reinforcement and contingencies not accessible by more constricted forms of responding. The additional learning that results from contacting those contingencies further expands the person's repertoire.

One direct way to program desired response generalization is to reinforce response variability when it occurs. The contingency between response variability and reinforcement can be formalized with a lag reinforce-

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ment schedule (Lee, McComas, & Jawar, 2002). On a **lag reinforcement schedule,** reinforcement is contingent on a response being different in some defined way from the previous response (a Lag 1 schedule) or a specified number of previous responses (Lag 2 or more). Cammilleri and Hanley (2005) used a lag reinforcement contingency to increase varied selections of classroom activities by two typically developing girls, who were selected to participate in the study because they spent the vast majority of their time engaged in activities not systematically designed to result in a particular set of skills within the curriculum.

At the beginning of each 60-minute session, the children were told they could select any activity and could switch activities at any time. A timer sounded every 5 minutes to prompt activity choices. During baseline there were no programmed consequences for selecting any of the activities. Intervention consisted of a lag reinforcement schedule in which the first activity selection and each subsequent novel selection were followed by the teacher handing the student a green card that she could exchange later for 2 minutes of teacher attention (resulting in a Lag 12 contingency, which was reset if all 12 activities were selected within a session).

Activity selections during baseline showed little variability, with both girls showing strong preferences for stackable blocks (Figure 28.10 shows results for one of the girls). When the lag contingency was introduced, both girls

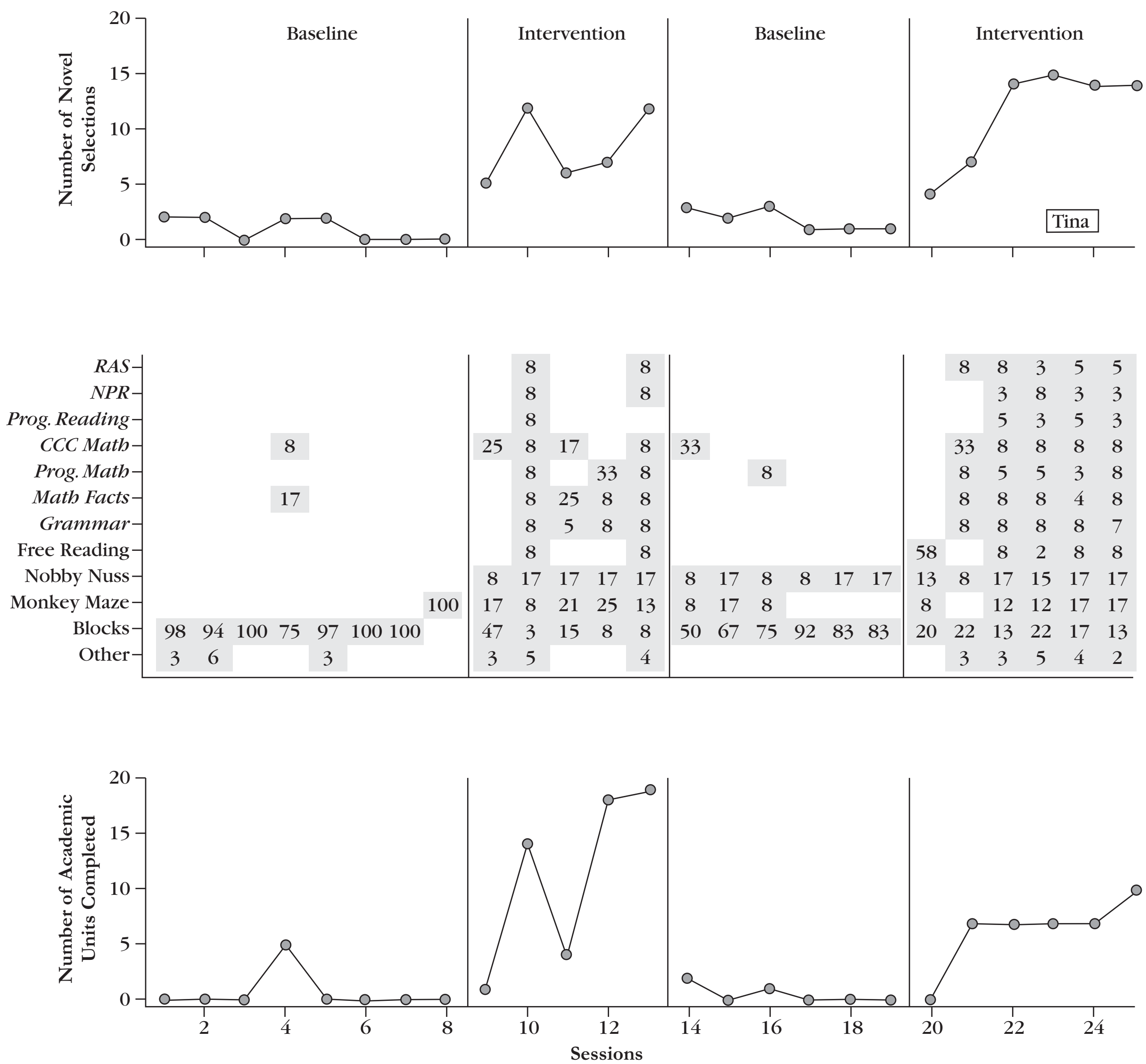

Figure 28.10 Number of novel activity selections (top panel), percentage of intervals of engagement in programmed (italicized) and nonprogrammed activities (middle panel; shaded cells indicate activities for which there was some engagement), and number of academic units completed (bottom panel).

From "Use of a Lag Differential Reinforcement Contingency to Increase Varied Selections of Classroom Activities" by A. P. Cammilleri and G. P. Hanley, 2005, *Journal of Applied Behavior Analysis, 38,* p. 114. Copyright 2005 by the Society for the Experimental Analysis of Behavior, Inc. Reprinted by permission.

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immediately selected and engaged in more diverse activities. The researchers noted that "an indirect but important outcome of this shift in time allocation was a marked increase in the number of academic units completed" (p. 115).

Instruct the Learner to Generalize

The simplest and least expensive of all tactics for promoting generalized behavior change is to "tell the subject about the possibility of generalization and then ask for it" (Stokes & Baer, 1977, p. 363). For example, Ninness and colleagues (1991) explicitly told three middle school students with emotional disturbance to use self-management procedures they had learned in the classroom to self-assess and self-record their behavior while walking from the lunchroom to the classroom. Hughes and colleagues (1995) used a similar procedure to promote generalization: "At the close of each training session, peer teachers reminded participants to self-instruct when they wished to talk to someone" (p. 207). Likewise, at the conclusion of each training session conducted in the special education classroom on how to recruit assistance from peers during cooperative learning groups, Wolford and colleagues (2001) prompted middle school students with learning disabilities to recruit peer assistance at least two times but not more than four times during each cooperative learning group in the language arts classroom.

To the extent that generalizations occur and are themselves generalized, a person might then become skilled at generalizing newly acquired skills, or in the words of Stokes and Baer (1977), become a "generalized generalizer."

Modifying and Terminating Successful Interventions

With most successful behavior change programs it is impossible, impractical, or undesirable to continue the intervention indefinitely. Withdrawal of a successful intervention should be carried out in a systematic fashion, guided by the learner's performance of the target behavior in the most important generalization settings. Gradually shifting from the contrived conditions of the intervention to the typical, everyday environment will increase the likelihood that the learner will maintain the new behavior patterns. When deciding how soon and how swiftly to withdraw intervention components, practitioners should consider factors such as the complexity of the intervention, the ease or speed with which behavior changed, and the availability of naturally existing contingencies of reinforcement for the new behavior.

This shift from intervention conditions to the postintervention environment can be made by modifying one or more of the following components, each representing one part of the three-term contingency:

- Antecedents, prompts, or cue-related stimuli
- Task requirements and criteria
- Consequences or reinforcement variables

Although the order in which intervention components are withdrawn may make little or no difference, in most programs it is probably best to make all task-related requirements as similar as possible to those of the post-intervention environment before withdrawing significant antecedent or consequence components of the intervention. In this way the learner will be emitting the target behavior at the same level of fluency that will be required after the complete intervention has been withdrawn.

A behavior change program carried out many years ago by a graduate student in one of our classes illustrates how the components of a program can be gradually and systematically withdrawn. An adult male with developmental disabilities took an inordinate amount of time to get dressed each morning (40 to 70 minutes during baseline), even though he possessed the skills needed to dress himself. Intervention began with a construction paper clock hung by his bed with the hands set to indicate the time by which he had to be fully dressed to receive reinforcement. Although the man could not tell time, he could discriminate whether the position of the hands on the real clock nearby matched those on his paper clock. Two task-related intervention elements were introduced to increase the likelihood of initial success. First, he was given fewer and easier clothes to put on each morning (e.g., no belt, slip-on loafers instead of shoes with laces). Second, based on his baseline performance, he was initially given 30 minutes to dress himself, even though the objective of the program was for him to be completely dressed within 10 minutes. An edible reinforcer paired with verbal praise was used first on a continuous schedule of reinforcement. Figure 28.11 shows how each aspect of the intervention (antecedent, behavior, and consequence) was modified and eventually withdrawn completely, so that by the program's end the man was dressing himself completely within 10 minutes without the aid of extra clocks or charts or contrived reinforcement other than a naturally existing schedule of intermittent praise from staff members.

Rusch and Kazdin (1981) described a method for systematically withdrawing intervention components while simultaneously assessing response maintenance that they called "partial-sequential withdrawal." Martella, Leonard, Marchand-Martella, and Agran (1993) used a partial-sequential withdrawal of various components of a self-monitoring intervention they had implemented to

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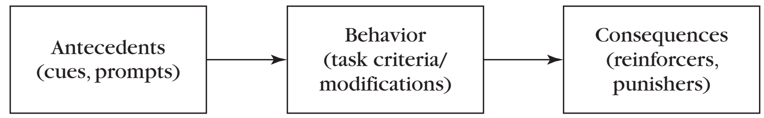

Antecedents	Behavior	Consequences
A: Mock clock showing when must be dressed	A: Fewer clothes	A: Edible reinforcer
B: No clock	B: Full set of clothes	B: Token reinforcer
	C: Time gradually reduced	C: Chart (self-record)
	D: Criterion time limit	D: Praise on intermittent schedule
	E: Variety of clothes	

Phase			
1	A	A	A
2	A	A	B
3	A	B	B
4	A	B/C	C
5	A	B/D	C
6	B	B/D	C
7	B	D/E	C
8	B	D/E	D

Figure 28.11 An example of modifying and withdrawing components of an independent morning dressing program for an adult with developmental disabilities to facilitate maintenance and generalization.

help Brad, a 12-year-old student with mild mental retardation, reduce the number of negative statements (e.g., "I hate this @#!%ing calculator," "Math is crappy") he made during classroom activities. The self-management intervention consisted of Brad (a) self-recording negative statements on a form during two class periods, (b) charting the number on a graph, (c) receiving his choice from a menu of "small" reinforcers (items costing 25 cents or less), and (d) when his self-recorded data were in agreement with the trainer and at or below a gradually reducing criterion level for four consecutive sessions, he was allowed to choose a "large" reinforcer (more than 25 cents). After the frequency of Brad's negative statements was reduced, the researchers began a four-phase partial-sequential withdrawal of the intervention. In the first phase, charting and earning of "large" reinforcers were withdrawn; in the second phase, Brad was required to have zero negative statements in both periods to receive a daily "small" reinforcer; in the third phase, Brad used the same self-monitoring form for both class periods instead of one form for each period as before, and the small reinforcer was no longer provided; and in the fourth phase (the follow-up condition), all components of the intervention were withdrawn except for the self-monitoring form without a criterion number highlighted. Brad's negative statements remained low throughout the gradual and partial withdrawal of the intervention (see Figure 28.12).

A word of caution is in order regarding the termination of successful behavior change programs. Achieving socially significant improvements in behavior is a defining purpose of applied behavior analysis. Additionally, those improved behaviors should be maintained and should show generalization to other relevant settings and behaviors. In most instances, achieving optimal generalization of the behavior change will require most, if not all, of the intervention components to be withdrawn. However, practitioners, parents, and others responsible for helping children learn important behaviors are sometimes more concerned with whether and with how a potentially effective intervention will eventually be withdrawn than they are with whether it will produce the needed behavior change. Considering how a proposed intervention will lend itself to eventual withdrawal or blending into the natural environment is important and consistent with everything recommended throughout this book. And clearly, when the choice is between two or more interventions of potentially equal effectiveness, the intervention that is most similar to the natural environment and the easiest to withdraw and terminate should be given first priority. However, an important behavior change should not go unmade because complete withdrawal of the intervention required to achieve it may never be possible. Some level of intervention may always be required to maintain certain behaviors, in which case attempts to continue the necessary programming must be made.

The Sprague and Horner (1984) study on teaching generalized vending machine use provides another example of this point. The six students with moderate to severe mental retardation who participated in the program were given cue cards to aid them in operating a vending machine without another person's assistance. The cue cards, which had food and drink logos on one side and pictures of quarters paired with prices on the other, not only were used during instruction and generalization probes, but also were kept by the students at the end of the program. Five of the six students still carried a cue card and were using vending machines independently 18 months after the study had ended.

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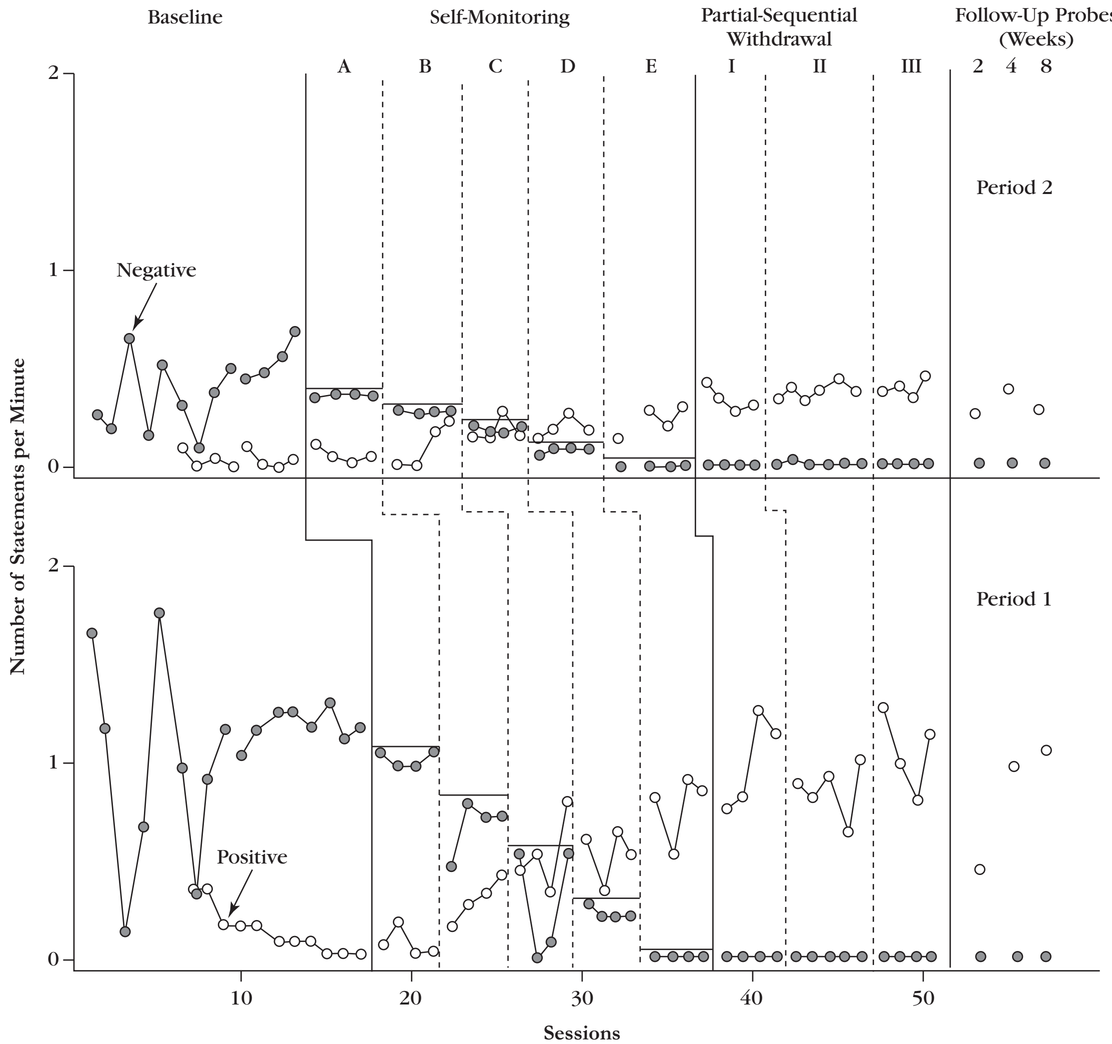

Figure 28.12 Number of negative (solid data points) and positive (open data points) statements in two class periods by an adolescent boy with disabilities during baseline, self-monitoring, and partial-sequential withdrawal conditions. Horizontal lines during self-monitoring condition show changing criteria for teacher-delivered reinforcement.

From "Self-Monitoring Negative Statements" by R. Martella, I. J. Leonard, N. E. Marchand-Martella, and M. Agran, 1993, *Journal of Behavioral Education, 3,* p. 84. Copyright 1993 by Human Sciences Press. Reprinted by permission.

Guiding Principles for Promoting Generalized Outcomes

Regardless of the specific tactics selected and applied, we believe that practitioners' efforts to promote generalized behavior change will be enhanced by adherence to five guiding principles:

- Minimize the need for generalization as much as possible.
- Conduct generalization probes before, during, and after instruction.
- Involve significant others whenever possible.
- Promote generalization with the least intrusive, least costly tactics possible.
- Contrive intervention tactics as needed to achieve important generalized outcomes.

Minimize the Need for Generalization

Practitioners should reduce the need for generalization to untaught skills, settings, and situations as much as possible. Doing so requires thoughtful, systematic assessment of what behavior changes are most important. Practitioners should prioritize the knowledge and skills that will most often be required of the learner and the settings and

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situations in which the learner will most often benefit from using those skills. In addition to the environment(s) in which the learner is currently functioning, practitioners should consider the environments in which the learner will function in the immediate future and later in life.

The most critical behavior changes should not be relegated to the not-for-certain technology of generalization. The most important skill-setting-stimulus combinations should always be taught directly and, when possible, taught first. For example, a training program to teach a young adult with disabilities to ride the public bus system should use the bus routes the person will take most often (e.g., to and from her home, school, job site, and community recreation center) as teaching examples. Instead of providing direct instruction on routes to destinations the learner may visit only occasionally after training, use those routes as generalization probes. Achieving a high level of response maintenance on the trained routes will still be a challenge.

Probe for Generalization Before, During, and After Instruction

Generalization probes should be conducted prior to, during, and after instruction.

Probe Before Instruction

Generalization probes conducted before instruction begins may reveal that the learner already performs some or all of the needed behaviors in the generalization setting, thereby reducing the scope of the teaching task. It is a mistake to assume that because a learner does not perform a particular behavior in the instructional setting, she does not or cannot do it in the generalization setting(s). Preinstruction generalization probe data are the only objective basis for knowing that the learner's performance of the target behavior *after instruction* is in fact a generalized outcome.

Probes before instruction enable observation of the contingencies that operate in the generalization setting. Knowledge of such information may contribute to a more effective treatment or instruction.

Probe During Instruction

Generalization probes during instruction reveal if and when generalization has occurred and if and when instruction can be terminated or shifted in focus from acquisition to maintenance. For example, a teacher who finds that a student can solve untaught examples of a particular type of algebraic equation after receiving instruction on just a few examples and shifts instruction to the next type of equation in the curriculum, will cover more of the algebra program effectively than will a teacher who continues to present additional examples.

Results of probes during instruction also show whether generalization is not occurring, thereby indicating that a change in instructional strategies is needed. For example, when Sprague and Horner (1984) observed that one student's poor performance on the first generalization probe was caused by a ritualistic pattern of inserting coins, they incorporated repeated practice on the coin insertion step during a training session and the student's performance on the generalization task improved greatly.

Probing can often be made more efficient by contriving opportunities for the learner to use her new knowledge or skill. For example, instead of waiting for (and perhaps missing) naturally occurring opportunities for the learner to use her new conversational skills in the generalization environment, a practitioner could enlist the assistance of a "confederate" peer to approach the learner. Ninness, Fuerst, and Rutherford, (1991) used contrived generalization probes in which students were provoked or distracted to test the extent to which they used a set of self-management skills.

Contrived generalization probes can also be used as primary measures of acquisition and generalization. For example, Miltenberger and colleagues (2005) contrived opportunities to measure and teach children's use of gun safety skills by placing a gun in home and school locations where the children would find it. If a child did not execute the target safety skills when finding a gun (i.e., do not touch it, get away from the gun, and tell an adult), the trainer entered the room and conducted an *in situ* training session, asking the child what he should have done and rehearsing the entire sequence five times.

Probe After Instruction

Generalization probes after instruction has ended reveal the extent of response maintenance. The question of how long probes should be conducted after instruction has ended should be answered by factors such as the severity of the target behavior, the importance of the behavior change to the person's quality of life, the strength and consistency of the response maintenance obtained by probes to date, and so forth. The need for long-term assessment of maintenance is especially critical for severe behavior problems. In some cases, maintenance probes over many months and several years may be indicated (e.g., Derby et al., 1997; Foxx, Bittle, & Faw, 1989; Wagman, Miltenberger, & Woods, 1995).

If conducting systematic generalization and maintenance probes seems too difficult or too contrived, the practitioner should consider the relative importance of the target behavior to the student or client. If a behavior is important to target for intervention then assessing the

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generalized outcomes of that intervention is worth whatever effort that assessment requires.

Involve Significant Others

> All persons are potential teachers of all sorts of behavior changes. Just because you are designated as "teacher" or "behavior analyst" does not mean that you have an exclusive franchise on the ability to make deliberate behavior changes. In fact, there is no possibility of such a franchise. Everyone in contact contributes to everyone else's behavior, both to its changes and its maintenance.
>
> — Donald M. Baer (1999, p. 12)

Teaching for generalized outcomes is a big job, and practitioners should try to get as much help as they can. People are almost always around where and when important behaviors need to be prompted and reinforced; and when social behaviors are targeted, people are there by definition.

In virtually every behavior change program people other than the participant and the behavior analyst are involved, and their cooperation is crucial to the success of the program. Foxx (1996) stated that in programming successful behavior change interventions, "10% is knowing what to do; 90% is getting people to do it. . . . Many programs are unsuccessful because these percentages have been reversed" (p. 230). Although Foxx was referring to the challenge and importance of getting staff to implement programs with the consistency and fidelity needed for success, the same holds for the involvement of significant others.

Baer (1999) suggested identifying others who will or may be involved in a behavior change program as active supporters or tolerators. An active supporter is someone naturally present in the generalization setting who helps promote the generalization and maintenance of the target behavior by doing specific things. Active supporters help facilitate the desired generalized outcomes by arranging opportunities for the learner to use or practice the new skill, giving cues and response prompts for the behavior, and providing reinforcement for performance of the target behavior.

Active supporters for a behavior change program to teach independent eating to a child with severe disabilities might include one or two key people in the school's cafeteria, a volunteer or aide who works regularly with the child, the child's parents, and an older sibling. These people are vital parts of the teaching team. If optimal generalization is to occur, the active supporters must see to it that the learner has many opportunities to use the new skill in the generalization environments they share, and the natural reinforcers they control in those environments (e.g., praise, touch, smiles, companionship) must be used as consequences for the target behavior. It is not necessary, and probably not desirable, to limit an active supporters list, to school staff, family members, and peers. They may not be regularly available in all the environments and situations in which generalization is desired.

A tolerator is someone in the generalization setting who agrees not to behave in ways that would impede the generalization plan. Tolerators should be informed that the learner will be using a new skill in the generalization environment and asked to be patient. In an independent eating program a list of tolerators would likely include some members of the child's family, school cafeteria staff, and peers. Beyond the home and school environments the behavior analyst should consider the possible role of the general public with whom the child may find herself sharing a table or dining area in a public restaurant. The learner's initial sloppiness and slowness (she may always be sloppier and slower than most people) as she makes the first attempts beyond the familiar contingencies of home and school might result in various responses from strangers that could punish the new eating skills. Being stared at, laughed at, talked about, told to hurry up, or even offered assistance could reduce the possibility of generalization. Certainly, the behavior analyst can inform various school staff and family members of the ongoing eating program and request that they not interfere with the child's attempts to eat independently. But the public at large is another issue. It is impossible to inform everyone of the program. However, by considering the types of intolerant behaviors that the learner may encounter in the generalization setting, the teaching program can be constructed to include practice under such intolerant conditions. Instructional trials might be contrived to reinforce the learner for ignoring rude remarks and continuing to eat independently.

Use the Least Intrusive, Least Costly Tactics Possible

Behavior analysts should use less intrusive and less costly tactics to promote generalization before using more intrusive and costly tactics. As noted previously, simply reminding students to use their new skills in the generalization setting is the easiest and least expensive of all methods that might promote generalization. Although practitioners should never assume that telling the learner to generalize will produce the desired outcomes, neither should they fail to include such a simple and cost-free tactic. Similarly, incorporating some of the most relevant features of the generalization setting into the instructional setting (i.e., programming common stimuli) often helps produce the needed generalization and is less costly than conducting instruction in the natural setting (e.g., Neef, Lensbower et al., 1990; van den Pol et al., 1981).

Not only is using less costly tactics good conservation of the limited resources available for teaching, but

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also less intrusive interventions with fewer moving parts are easier to withdraw. Systematic generalization probes will determine whether generalization has occurred and whether more elaborate and intrusive intervention and supports are needed.

Contrive Intervention Tactics as Needed to Achieve Important Generalized Outcomes

A practitioner should not be so concerned about intrusiveness that she fails to implement a potentially effective intervention or procedures that will achieve important outcomes for the learner. Therefore, if necessary, practioners should disregard the previous guideline and contrive as many instruction and generalization tactics as necessary to enable the learner to generalize and maintain critical knowledge and skills.

Rather than lament the lack of generalization or blame the learner for his inability to show generalized behavior changes, the behavior analyst should work to arrange whatever socially valid contingencies may be needed to extend and maintain the target behavior.

Some Final Words of Wisdom from Don Baer

The most difficult and important challenge facing behavioral practitioners is helping learners achieve generalized change in socially significant behaviors. A behavior change—no matter how important initially—is of little value to the learner if it does not last over time, is not emitted in appropriate settings and situations, or occurs in restricted form when varied topographies are desired.

Research during the past 30 years has developed and advanced the knowledge base of what Stokes and Baer (1977) described as an "implicit technology of generalization" into an increasingly explicit and effective set of strategies and tactics for promoting generalized behavior change. Knowledge of these methods, combined with knowledge of the basic principles and behavior change tactics described throughout this book, provides behavior analysts with a powerful approach for helping people enjoy healthy, happy, and productive lives.

We end this chapter with a dually wise observation by Don Baer (1999), in which he pointed out a fundamental truth about the relation between a person's experience (in this case, the nature of a lesson) and what is learned or not learned from that experience. Like Skinner before him, Baer wisely reminded us not to blame the learner for not behaving as we think he should.

> Learning one aspect of anything never means that you know the rest of it. Doing something skillfully now never means that you will always do it well. Resisting one temptation consistently never means that you now have character, strength, and discipline. Thus, it is not the learner who is dull, learning disabled, or immature, because all learners are alike in this regard: *no one learns a generalized lesson unless a generalized lesson is taught.* (p. 1) [emphasis in original]

Summary

Generalized Behavior Change: Definitions and Key Concepts

1. Generalized behavior change has taken place if trained behavior occurs at other times or in other places without having to be retrained completely in those time or places, or if functionally related behaviors occur that were not taught directly.
2. Response maintenance refers to the extent to which a learner continues to perform a behavior after a portion or all of the intervention responsible for the behavior's initial appearance in the learner's repertoire has been terminated.
3. Setting/situation generalization refers to the extent to which a learner emits the target behavior in settings or situations that are different from the instructional setting.
4. The instructional setting is the environment where instruction occurs and encompasses all aspects of the environment, planned or unplanned, that may influence the learner's acquisition and generalization of the target behavior.
5. A generalization setting is any place or stimulus situation that differs from the instructional setting in some meaningful way and in which performance of the target behavior is desired.
6. Response generalization refers to the extent to which a learner emits untrained responses that are functionally equivalent to the trained response.
7. Some interventions yield significant and widespread generalized effects across time, settings, and other behaviors; others produce circumscribed changes in behavior with limited endurance and spread.
8. Undesirable setting/situation generalization takes two common forms: overgeneralization, in which the behavior has come under control of a stimulus class that is too broad, and faulty stimulus control, in which the behavior

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comes under the control of an irrelevant antecedent stimulus.

9. Undesired response generalization occurs when any of a learner's untrained but functionally equivalent responses produce undesirable outcomes.

10. Other types of generalized outcomes (e.g., stimulus equivalence, contingency adduction, and generalization across subjects) do not fit easily into categories of response maintenance, setting/situation generalization, and response generalization.

11. The generalization map is a conceptual framework for combining and categorizing the various types of generalized behavior change (Drabman, Hammer, & Rosenbaum, 1979).

Planning for Generalized Behavior Change

12. The first step in promoting generalized behavior changes is to select target behaviors that will meet naturally existing contingencies of reinforcement.

13. A naturally existing contingency is any contingency of reinforcement (or punishment) that operates independent of the behavior analyst's or practitioner's efforts, including socially mediated contingencies contrived by other people and already in effect in the relevant setting.

14. A contrived contingency is any contingency of reinforcement (or punishment) designed and implemented by a behavior analyst to achieve the acquisition, maintenance, and/or generalization of a targeted behavior change.

15. Planning for generalization includes identifying all the desired behavior changes and all the environments in which the learner should emit the target behavior(s) after direct training has ceased.

16. Benefits of developing the planning lists include a better understanding of the scope of the teaching task and an opportunity to prioritize the most important behavior changes and settings for direct instruction.

Strategies and Tactics for Promoting Generalized Behavior Change

17. Researchers have developed and advanced what Stokes and Baer (1977) called an "implicit technology of generalization" into an increasingly explicit and effective set of methods for promoting generalized behavior change.

18. The strategy of teaching sufficient examples requires teaching a subset of all of the possible stimulus and response examples and then assessing the learner's performance on untrained examples.

19. A generalization probe is any measurement of a learner's performance of a target behavior in a setting and/or stimulus situation in which direct training has not been provided.

20. Teaching sufficient stimulus examples involves teaching the learner to respond correctly to more than one example of an antecedent stimulus and probing for generalization to untaught stimulus examples.

21. As a general rule, the more examples the practitioner uses during instruction, the more likely the learner will be to respond correctly to untrained examples or situations.

22. Having the learner practice a variety of response topographies helps ensure the acquisition of desired response forms and promotes response generalization. Often called multiple exemplar training, this tactic typically incorporates numerous stimulus examples and response variations.

23. General case analysis is a systematic method for selecting teaching examples that represent the full range of stimulus variations and response requirements in the generalization setting.

24. Negative, or "don't do it," teaching examples help learners identify stimulus situations in which the target behavior should not be performed.

25. Minimum difference negative teaching examples, which share many characteristics with positive teaching examples, help eliminate "generalization errors" due to overgeneralization and faulty stimulus control.

26. The greater the similarity between the instructional setting and the generalization setting, the more likely the target behavior will be emitted in the generalization setting.

27. Programming common stimuli means including in the instructional setting stimulus features typically found in the generalization setting. Practitioners can identify possible stimuli to make common by direct observation in the generalization setting and by asking people who are familiar with the generalization setting.

28. Teaching loosely—randomly varying noncritical aspects of the instructional setting within and across teaching sessions—(a) reduces the likelihood that a single or small group of noncritical stimuli will acquire exclusive control over the target behavior and (b) makes it less likely that the learner's performance will be impeded or "thrown off" by the presence of a "strange" stimulus in the generalization setting.

29. A newly learned behavior may fail to contact an existing contingency of reinforcement because it has not been taught well enough. The solution for this kind of generalization problem is to teach the learner to emit the target behavior at the rate, accuracy, topography, latency, duration, and/or magnitude required by the naturally occurring contingencies of reinforcement.

30. The use of intermittent schedules of reinforcement and delayed rewards can create indiscriminable contingencies, which promote generalized responding by making it difficult for the learner to discriminate whether the next response will produce reinforcement.

31. Behavior traps are powerful contingencies of reinforcement with four defining features: (a) They are "baited"

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with virtually irresistible reinforcers; (b) only a low-effort response already in the student's repertoire is needed to enter the trap; (c) interrelated contingencies of reinforcement inside the trap motivate the student to acquire, extend, and maintain targeted skills; and (d) they can remain effective for a long time.

32. One way to wake up an existing but inoperative contingency of reinforcement is to ask key people in the generalization setting to attend to and praise the learner's performance of the target behavior.

33. Another tactic for waking up a natural contingency of reinforcement is to teach the learner how to recruit reinforcement in the generalization setting.

34. One tactic for mediating generalization is to bring the target behavior under the control of a contrived stimulus in the instructional setting that will reliably prompt or aid the learner's performance of the target behavior in the generalization setting.

35. Teaching a learner self-management skills with which he can prompt and maintain targeted behavior changes in all relevant settings at all times is the most potentially effective approach to mediating generalized behavior changes.

36. The strategy of training to generalize is predicated on treating "to generalize" as an operant response class that, like any other operant, is selected and maintained by contingencies of reinforcement.

37. One tactic for promoting response generalization is to reinforce response variability. On a lag reinforcement schedule, reinforcement is contingent on a response being different in some defined way from the previous response (a Lag 1 schedule) or a specified number of previous responses (Lag 2 or more).

38. The simplest and least expensive tactic for promoting generalized behavior change is to tell the learner about the usefulness of generalization and then instruct him to do so.

Modifying and Terminating Successful Interventions

39. With most successful behavior change programs it is impossible, impractical, or undesirable to continue the intervention indefinitely.

40. The shift from formal intervention procedures to a normal everyday environment can be accomplished by gradually withdrawing elements comprising the three components of the training program: (a) antecedents, prompts, or cue-related stimuli; (b) task modifications and criteria; and (c) consequences or reinforcement variables.

41. An important behavior change should not go unmade because complete withdrawal of the intervention required to achieve it may never be possible. Some level of intervention may always be required to maintain certain behaviors, in which case attempts must be made to continue necessary programming.

Guiding Principles for Promoting Generalized Outcomes

42. Efforts to promote generalized behavior change will be enhanced by adhering to five guiding principles:

- Minimize the need for generalization as much as possible.
- Conduct generalization probes before, during, and after instruction.
- Involve significant others whenever possible.
- Promote generalized behavior change with the least intrusive, least costly tactics possible.
- Contrive intervention tactics as needed to achieve important generalized outcomes.

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