Chapter 2

Designing Effective Strategies of Change: Essential Building Blocks

Goals

1. Define and distinguish among behavior, learning, and teaching.
2. Define and illustrate operant class and the three-term contingency.
3. Define, illustrate, and differentiate behavioral principles and procedures.
4. Define and distinguish among environment, stimulus, and stimulus class.
5. Define and illustrate:
   a. unconditioned (or unconditional) respondent behavior
   b. conditioned (or conditional) respondent behavior
   c. unconditioned stimuli
   d. conditioned stimuli
   e. respondent or classical conditioning
5. Define and illustrate:
6. Differentiate as to when to use the verbs elicit and evoke.
7. Define operant behavior and operant learning.¹
8. Define and illustrate:
   a. contingencies
   b. reinforcement
   c. positive reinforcement
   d. negative reinforcement
   e. extinction
   f. punishment
   g. positive punishment
   h. negative punishment
   i. stimulus control

¹Some use the term operant conditioning instead; we prefer to avoid that usage because of the potential confusion between operant and respondent processes, which are quite different.
Six hours into his shift as a service representative, Rudolfo receives a call from a customer who opens the conversation with “What kind of a company are you working for anyway? If you ask me, you’re all a bunch of ##!xx#’s!” How does Rudolfo remain calm, as he was trained to do?

Mr. Straus has asked his students to read a few pages of The Catcher in the Rye. While the other students in the group are reading their assignment, Ahmad raises his hand. He describes his own impressions of the work and displays much more insight than that of his classmates. Mr. Straus hopes to capitalize on this teaching moment, but doesn’t know how. He doesn’t want to risk singling Ahmad out as someone he favors, yet would like to draw the other students’ attention to Ahmad’s excellent analysis. How should he proceed?

While visiting her mom in the hospital, Vera notes with dismay a staff member moving over from caring for her mom’s roommate, suspected of having a communicable disease, to adjusting Mom’s breathing apparatus. “For heavens sake! Aren’t you going to wash your hands?” What might the hospital do to prevent such risky situations?

The teacher grabs Stevie’s hand just as the three-year-old is about to put a ladybug in his mouth. Stevie responds by producing a major meltdown: kicking, screaming, and flailing about. What is the teacher to do?

Each of the previous examples represents the kinds of behavioral challenges any of us might be called upon to address in the course of everyday life. Behavior analysts are trained to handle situations like these, along with a myriad of others involving what people say or do. In Chapter 1 we defined applied behavior analysis (ABA). In this chapter, we begin by introducing you to and illustrating a set of fundamental concepts and terms you will encounter as you explore what learning and behavior are about and how they are influenced.

WHAT IS BEHAVIOR?

“Behavior is what an organism is doing; or more accurately what it is observed by another organism to be doing” (Skinner, 1938, p. 6)

Given that the central theme of this text deals with changing or modifying behavior, we must first define the term. As described in Chapter 1, when we talk about behavior, we are referring to what any organisms (including people) say or do. Chirping, poking food into a nestling’s mouth, writing, cursing, walking, crying, answering questions, hugging, solving math equations, spitting, smiling, reciting a poem, describing, imagining, or visualizing a picture, or writing a term paper are all instances of behavior.

Behavior is action. So labels, states, or personal characteristics like happy, sad, and alert are not included. But chirping, mating, hitting someone, crying, and smiling are behaviors. Behavior analysts are not concerned with describing organisms’ appearance or personality traits. Their focus is on people’s (or animals’) actions and the functions of those acts. For example, a behavior analyst would not say “Dexter is lazy,” but might comment that he frequently fails to complete his work. Calling Paula a procrastinator would not be appropriate, but commenting that she regularly delays completing her assignments until the last
moment would be an acceptable way to describe her pattern of performance. We would not identify Bruno as “a prodigy,” although we might say he plays the piano extremely skillfully. We do not label Lucretia as a rotten little kid, but as a child who frequently hits other children and grabs their toys. Viewing problematic situations in terms of what people do, rather than what they are, opens the possibility of change. We cannot alter who people are, but might be able to help change the way they act by assisting them to learn new or different response patterns.

WHAT IS LEARNING?

Learning consists of altering response patterns, generally as a function of changes in environmental conditions. Stated even more simply: learning = behavior change. The way we know an organism has learned something new is by observing changes in patterns of behavior in relation to particular environmental events. While new on the job, Melba, the bank teller, generally opened her interaction with a customer with “Yeah?” while looking off into the distance. After participating in a customer service training program, followed by intermittent supervisory feedback, now whenever a customer approaches, she regularly smiles, looks directly at, and greets the person with a phrase such as “How may I help you?” We could say that Melba has learned how to greet her customers in a friendly, helpful way.

WHAT IS TEACHING?

If we accept the notion that learning is a relatively enduring change in behavior that occurs as a function of changes in environmental conditions, then a reasonable definition of teaching is promoting learning by any or a combination of various means: showing, telling, guiding, and most important of all for educators, differentially reinforcing or arranging matters so that reinforcers follow a reasonable portion of those efforts directed towards meeting behavioral objectives (see Chapter 4). Parent birds do that by herding their fledglings to locations where food is available. Human parents and teachers choose a suitable environment and provide the kind of assistance that will enable the learner to succeed. This intentional teaching function also may be provided by managers, trainers, supervisors, peer tutors, religious leaders, philosophers, politicians, editorial writers, lecturers, and many others. Informal or even unacknowledged teaching goes on as well, as when the actions of peers, parents, family members, celebrities, and the wealthy and powerful serve as models for others to imitate, perhaps gaining similar reinforcement in the process.

As all of us know, however, there is “teaching” and there is (effective) teaching that produces learning. Teaching runs the gamut from being really effective to tragically inefficient or even counterproductive. Why do some students become enamored of their subjects while others consider them a nuisance? How is it that some trainees become proficient at certain skills, while others remain incapable of performing the task? Certainly, native physical and intellectual attributes and deficits play a role, but the manner in which the environment supports efficient and successful behavior change matters a great deal. Here is where applied behavior analysis (ABA) makes its entrance. ABA is designed to capitalize on the ever-growing body of knowledge about learning and behavior by effectively applying the principles derived from that knowledge toward promoting ethically sound, adaptive and durable behavior change.

HOW DOES BEHAVIOR ANALYSIS WORK?

Behavior analysis works by breaking “…complex behavior down into its functional parts. A successful analysis should allow the behavior to be synthesized by putting the parts back together” (Catania, 2006). To accomplish such a lofty purpose, behavior analysis restricts itself to actions that can validly and reliably be observed and recorded, either by the person engaging in the behavior or by others. For example, engaging in “self-talk” would be considered behavior only if instances of “self-talk” could be validly recorded—as in using a voice recorder or a written narration to chronicle what the person is
saying in the absence of an audience. (For a more detailed delineation of the concept of behavior, refer to basic operant learning texts: Catania, 2006; Johnston & Pennypacker, 1980; and Skinner’s historically important 1938 text.)

In practice, the terms behavior and response tend to be used somewhat interchangeably and are usually reserved for specific instances of activity. However, different responses or behaviors often produce similar results under similar circumstances. When this occurs we refer to these behaviors as belonging to an operant class: “the composite set of behaviors that result in a single type of reinforcing event” (Ferster & Skinner 1957). For example, when a baby cries or fusses, the crying or fussing are each specific behaviors. However, when the baby cries or fusses when hungry and then gets fed, the crying and fussing become part of the same operant class, in that they tend to produce the same reinforcer. When we talk about “going to the store,” the operant class might include walking and/or bicycling or driving. If our concern is with changing Johnny’s “aggressive behavior,” we actually are referring to changing the operant class that includes Johnny’s throwing objects, kicking, or shouting when ignored, because in the past all of these have produced his mom’s attention. Unsafe responses such as failing to put on safety equipment and omitting other safety precautions, when in a hurry to get home for dinner, fall within the same operant class, risky behavior; but refusing to use safety goggles because they distort the worker’s vision and taking shortcuts to be able to leave work earlier are members of two different operant classes, because they produce different reinforcers. Similarly, two different things are happening when we coach Mary to say “milk” and provide her with milk as a consequence, versus when we attempt to teach her to say “milk” by holding up a picture of a glass of milk and ask Mary to tell us the name of the picture. (Later you will learn that the first instance of saying “milk” is called manding and the second is called tacting; see Chapter 19.)

Generally, in ABA the goal is to change operant classes, the composite set of behaviors that result in a single type of reinforcing event, rather than one specific form or topography of a behavior. We need to remind ourselves to view both the specific set of responses that compose an operant class along with the reinforcing function, or purpose, of any of the responses constituting the class. (See Figure 2.1 and Chapters 9 and 10 for more information related to function, especially of unwanted behavior.)

When we add the function of a response to the formula, we really are talking about the A-B-Cs of behavior analysis, or said another way: we are referring to a three-term contingency. The three-term contingency refers to the interdependency among the antecedent conditions (A), the behavior (B), and the consequences (C). For example: a picture of a dog, an actual dog, or the word “dog” (A) can all set the stage for the response “dog” (B), which then is followed by praise or confirmation (C).

**Behavioral Principles and Procedures**

You can see that we generally are talking about clusters of antecedents. These antecedent clusters set the stage for particular operant classes, which in turn may consist of a number of functionally related

**Operant Class:** “A preschooler asking for help, as in manipulating a stuck zipper.”

- **Response 1 = Shouting “help!”**
- **Response 2 = Shrugging shoulders and producing an expression of helplessness.**
- **Response 3 = Saying “I can’t do it!”**
- **Response 4 = Holding up a “help” sign.**

\[→ \text{Gets help.}\]

Figure 2.1  Illustrative response class
responses. Now, we introduce two other important concepts: 1) principles of behavior (behavioral principles) and 2) behavioral procedures. A principle of behavior is a scientifically derived rule of nature that describes the enduring and predictable relation between a biological organism's responses and given arrangements of stimuli (objects and events that can influence behavior). Principles of behavior are discovered through careful scientific investigation. When we technically apply behavioral principles for the explicit purpose of changing (shaping, teaching, modifying, managing) behavior we are engaging in behavioral analytic procedures.

Behavior analysts working in applied settings, such as schools, homes, businesses, manufacturing, service, health care, or civic organizations, turn their knowledge of behavioral principles into practices. These practices are designed to influence performance in specific (we trust ethically sound) ways to teach new knowledge or skills, and/or to manage, motivate, support, sustain, or weaken particular behavior under given circumstances. To illustrate, let us look at how one practice is derived from the procedure we call positive reinforcement. In positive reinforcement, an increase in the rate or probability of behavior is a function of the frequency with which that behavior is reinforced. Recognizing the importance of the frequency of applying reinforcers enables practitioners to apply positive reinforcement more effectively to assist individuals in learning new skills such as using grammatical rules, adding columns of figures, strumming a guitar, assembling the parts of a product, saying “thank you,” opening a door for someone, or (fill in the blank with respect to any given behavior you might want to change in your own life). The better informed they are about conditions that alter the effectiveness of positive reinforcement, the more efficiently practitioners can design successful behavioral procedures.

Consider an example: Deborah’s niece Fiona often refused to share her toys with other children. Noticing that Fiona welcomes hugs and praise (choosing stimuli known to be effective under like conditions is one factor that makes reinforcement effective), Deborah hugged and praised copiously when Fiona shared her toys. Fiona now shares her toys more often while participating in play groups. In more technical terms, Deborah applied positive reinforcement, recognizing that the rate of behavior probably would increase if rapidly and frequently followed by reinforcers known to be effective under the circumstances. Fiona was encouraged, thereby, to share her toys.

WHAT DOES THE TERM ENVIRONMENT MEAN?

How Does Environment Differ from Stimulus?

The environment in which a person behaves is considered its context, whereas a stimulus is a specific event or combination of events (stimuli) that may influence behavior. For example, in Mr. Brennan’s classroom (the context or environment), Mark is told to do his spelling exercise (the antecedent stimulus). (See Figure 2.2.) Mark complies with Mr. Brennan’s request (the behavior). As a result, Mr. Brennan smiles and compliments Mark (the consequent stimuli.)

Similar to viewing single behaviors as being composed of operant classes, we recognize reinforcing consequences can vary in their levels of complexity as well. Typically, too, the context in which an individual behaves generally is composed of multiple stimuli. In Mark’s situation, stimuli abound within the classroom: the desk, the lights, the books, the other children and the teacher and their actions, the lesson board, the clock, and so on. Generally speaking, not all of those stimuli actually are responsible for or functionally related to the operant class, or behavior of concern. For instance, the antecedent exerting the strongest influence over Mark’s compliance might have been the fact that Mr. Brennan also is the football coach and Mark is eager to make the team.

The stimulus, or stimuli, responsible for the occurrence of the behavior might be part of a broader stimulus class: a group of stimuli that have a common effect on an operant class and vary across

---

1The term behavioral law is occasionally applied when such relationships repeatedly occur both within and across species under all sorts of varying conditions.
physical dimensions (Pierce & Cheney, 2008). The instructions for a spelling exercise could be part of a larger stimulus class that includes any of Mr. Brennan’s instructions. Other stimuli, perhaps in the form of a substitute teacher who lacks the same potential function of inviting Mark to join the team, are excluded. In other words, Mark tends to comply when Mr. Brennan assigns a spelling exercise, regardless of who else is there, the color of the classroom walls, the weather or lighting conditions, and so on. On the other hand, in Mr. Brennan’s absence, Mark may not necessarily complete his spelling exercises, even if he is capable of doing so, despite all of the other non-functional stimuli (children, lighting, etc.) present.

Johnny hits his sister when his mother is in the room. Perhaps his mother and sister are members of a stimulus class composed of people whose attention is reinforcing to Johnny. So when his mother and sister are nearby, but are attending to other things for a while, the occasion is set for Johnny to hit his sister. As you might imagine, Johnny’s action has a good likelihood of producing a reinforcer in the form of both his mother’s and his sister’s attention.

Similarly, Ned starts complaining about the production line when his supervisor Pat and co-worker Jared pass by. It is likely that both Pat and Jared are members of a stimulus class composed of people whose attention is reinforcing to Ned. So after Ned has been working alone for a while, without any social interactions, the occasion is set for Ned to start complaining when Pat and Jared show up. From past experience Ned has learned that complaining has a good chance of producing reinforcement in the form of attention from both Pat and Jared.

When analyzing operant behavior, we can view such stimulus classes as analogous to antecedent or discriminative stimulus classes, in the sense that they can be complex units functioning within the three-term contingency. In fact, it is hard to illustrate or talk about one without the other. To avoid confusion, when considering discriminative (antecedent) and reinforcing (consequential) stimuli within any three-term contingency, think about both operant classes and stimulus classes. Therefore, when you plan to analyze or modify behavior, remind yourself that applied behavior analysis is based on the assessment and modification of one or more components.
of the three-term contingency. Trusting you now recognize that *often it is not a single stimulus, but a collection of stimuli* that are affecting behavior, we will discuss how these stimuli exert such control or influence over behavior.

**RESPONDENT BEHAVIOR AND RESPONDENT CONDITIONING**

Unconditioned respondent behaviors are behaviors reliably elicited by stimuli that produce them despite any prior learning. Unconditioned respondents are also known as reflexes and generally are thought of as behaviors with which the individual was endowed at birth. Particular preceding or antecedent stimuli directly produce (“elicit”) respondent behavior. Those eliciting stimuli are referred to as unconditioned stimuli (USs) and the responses those stimuli elicit are referred to as unconditioned responses (URs).

Familiar USs are a bright light shined into the eyes causing the pupils to contract (UR); an object touching an infant’s lips (US) producing sucking (UR); or a foreign object in throat (US) eliciting gagging (UR). The essential feature of an unconditioned reflex is that it does not depend on learning. The stimulus directly elicits/produces the response. Many of these relations between stimuli and their elicited responses have been assigned the term “reflex”: the gag reflex, the salivary reflex, and so on. Although all of us are born with the capability for emitting a broad set of specific unconditioned responses, we can acquire novel stimulus-response combinations through a process called respondent conditioning.5

Respondent conditioning originated from Pavlov’s work on the salivary reflex in dogs. In respondent conditioning (also referred to as classical conditioning), a new relation develops between a stimulus and a formerly unconditioned response. This takes place when a neutral stimulus (NS), *one that does not automatically elicit a UR*, is paired with a US, thereby producing a UR. As those pairings continue, the formerly neutral stimulus gradually gains the eliciting properties of the US, eventually changing into a conditioned stimulus (CS) capable of eliciting a response generally similar to the UR, the conditioned response (CR).

Pavlov found that in the absence of any prior learning, dogs salivated when meat powder was placed in their mouths. One might describe this phenomenon as “meat powder eliciting salivation.” The meat powder was the unconditioned stimulus (US) and the salivation was the unconditioned response (UR). When Pavlov rang a bell (the neutral stimulus: NS), though, the dogs did not salivate. Yet, when Pavlov regularly paired the sound of the bell with delivery of the meat powder (NS + US), the sound of the bell began to acquire conditioned stimulus properties. After a number of those pairings, the bell alone elicited salivation, even when the dog received no meat powder. The bell became the CS and the salivation elicited by the bell was the CR (see Figure 2.3).

Sometimes respondent conditioning has “survival value,” as in the illustration above. At other times it does not. For example, suppose as a result of an unrelated stomach virus (US), Margaret became nauseated (UR) immediately after eating spinach salad (NS). Perhaps the next time Margaret went out to lunch, just the sight of the spinach salad (CS) caused her to feel nauseated (CR). Respondent conditioning may have been to blame.

It is important to note that just as a NS can become a CS, repeatedly presenting the CS in the absence of the US can also lead to the conditioned stimulus no longer eliciting the CR. So with respect to Margaret becoming nauseated at the sight of spinach salad, were she determined to overcome her conditioned aversion toward the greens, she might consume tiny quantities of the salad as a first step. Assuming she continues those trials while remaining healthy, and continues to add larger and larger portions over time, eventually the spinach would no longer elicit the CR: the feelings of nausea. Actually the acquisition of “irrational fears” of formerly neutral stimuli, [e.g., fear of spiders (arachnophobia), of large open spaces (agoraphobia) or enclosed spaces (claustrophobia), and/or various other conditioned

----

5Although applied behavior analysts emphasize operant conditioning most heavily in their work, they do recognize the important role respondent conditioning can play in understanding and changing behavior.
Behavior therapists use a practice called “desensitization,” analogous to the method described above, to help “cure” clients’ of irrational phobias by diminishing the adverse impact of the conditioned stimulus (Walker, Hedberg, Clement, & Wright, 1981).

In the case of respondent conditioning, the key focus is on stimuli as “elicitors,” “causes,” or “producers” of behavior. (Figure 2.4 illustrates this relationship.)

In instances of respondent conditioning, responses are often said to be “involuntary” in the sense that the stimulus is essentially the sole cause of the response. With operant behavior, however, antecedent stimuli are not said to elicit responses. This distinction is made because the antecedents alone are not the causes of such responses. The antecedents work only in combination with the consequences arranged by the three-term contingences. Therefore the antecedents are said to set the occasion for or evoke behavior, as you will learn next.

**OPERANT BEHAVIOR AND OPERANT LEARNING**

Operant responses are not the same as reflex responses and are not said to have been elicited by preceding stimuli. Rather, their probability is

---

We use the verbs “evoke” or “occasion” for operant behavior; “elicit” for respondent behavior.
controlled by stimuli that follow the behavior, often in the presence of a given stimulus or stimuli. The future rate of the behavior is a function of its previous history of consequences. Moreover, the way the consequence relates to the antecedent stimuli usually defines the operant. So we can analyze the three-term (A-B-C) contingency by identifying the way the antecedent(s) or “A(s)” are related to the “B,” the behavior, and the “C,” the consequence. Thus, contingency refers to the specified dependencies or relations between behavior and its antecedents and consequences. (As we shall see later on, contingencies may be intrinsic features of environments, or they may be deliberately arranged, as in cases of teaching, training, preaching, convincing, managing, and so on. When behavior analysts intentionally present, withdraw, or withhold stimuli for the explicit purpose of affecting behavior, they refer to such actions as procedures.) In ABA, our concern generally is with modifying operant behavior. Therefore, the remainder of this chapter is devoted to explaining the basics of operant behavior.

THE “C” IN OPERANT LEARNING

We begin by discussing the end of the three-term-contingency because behavior change depends on consequences such as positive or negative reinforcement, extinction, punishment, timeout from reinforcement, and others. Without consequences, behavioral patterns will not change in any lasting way. While antecedents also exert a powerful influence on behavior, they first need to gain their influence through consequences (i.e., reinforcement, extinction, or punishment). Baby cries and is fed or cuddled or changed. Baby learns to cry more often under particular circumstances, and as most new parents know, sometimes those antecedents remain a complete mystery to them.

Positive and Negative Reinforcement Defined and Illustrated

In its broadest sense, the term reinforcement often is used both as a name for how behavior changes (e.g., “She increased the number of reports she completed on time. I suspect some kind of reinforcement is at work.”), or as a name for the contingencies or procedures that cause an increase or persistence in the probability of occurrence of a given response (e.g., “We used a reinforcement procedure consisting of delivering complimentary notes when she handed in her reports on time.”). Reinforcement of both kinds can be separated into two categories: 1) positive reinforcement and 2) negative reinforcement. In positive reinforcement, the organism gains a stimulus, dependent or contingent on a response, resulting in the rate of that response increasing or maintaining (e.g., praising your husband for taking out the trash, leading to an increase in how frequently he takes out the trash). Negative reinforcement (read this carefully, the terminology gets tricky here) occurs when a stimulus is subtracted contingent on a response, resulting in the rate of that response subsequently increasing or maintaining. (For example, nagging your husband to take out the trash and stopping the nagging once he takes it out. Afterward, he starts taking the trash out more often to avoid your nagging). The important thing to remember is that regardless of whether a “positive” stimulus is presented (praise in the above example), or an “aversive” stimulus removed (nagging in the above example), reinforcement functions to increase or maintain behavior (trash gets taken out more often in the above example.) It is not the nature of the stimulus, but the fact that it is either presented (added, +) or removed (subtracted, -) that earns the procedure the title of positive, in the former, and negative, in the latter case. As we shall see later, sometimes the distinction is ambiguous: When a drink of water is a reinforcer, is that because the water has been presented or because it gets rid of the stimulus characteristics of a dry mouth? (See Chapter 5 for a more detailed explanation of reinforcement and Chapter 6 for specific methods for transforming neutral stimuli into reinforcers.) Moreover, if a particular operant behavior continues, by definition it is being reinforced at least some of the time. Conversely, as you will learn, if you want behavior to decrease, the (conceptually) simplest way is to make sure the behavior no longer generates reinforcement.
Extinction, Positive Punishment, and Negative Punishment Defined and Illustrated

Eliminating a reinforcement contingency (i.e., extinction), or adding either a positive or a negative punishment contingency, are three circumstances under which behavior decreases. Technically **extinction** is the discontinuation (cessation) of reinforcement as a consequence of a behavior, leading to a decrease in the frequency of that behavior. (Again, the vocabulary can apply either to the change in behavior or to the conditions that led to the change.)

Consider an example: Logan asks for a candy bar every time he and his mother are in line at the grocery store. When she tells him “no,” he flops down on the floor, kicks his feet, and starts to scream. His mom asks him to stop, but he doesn’t, so she gives him the candy bar. Logan stops screaming (which negatively reinforces Mom’s giving him the candy bar). The next time they are in line and Logan asks for a candy bar and his mom says “no,” he immediately repeats his tantrum until he gets the candy. Thus, we can assume Logan’s tantrums are being reinforced by his mom’s giving him the candy bar when he starts screaming and kicking his feet. If Logan’s mom were to ask you to help decrease Logan’s tantrums, you might suggest she use an extinction procedure, by advising her to stick to her guns and refrain from giving him the candy bar when he starts screaming and kicking. Discontinuing the reinforcer, by NOT giving him the candy bar during or shortly after the tantrum, should eventually result in Logan’s no longer throwing tantrums when his mom refuses him the candy bar. In that case, we might make an inference that the tantrums have undergone extinction. (See Chapter 27 for additional details of using extinction as a form of behavioral intervention.)

On the other hand, **punishment** is an event occurring contingent on a response that decreases the future probability of the response. Like reinforcement, punishment can be broken into two separate categories: positive punishment and negative punishment. In **positive punishment**, the individual experiences a (typically unpleasant) stimulus contingent on a response, resulting in a decrease in the future probability of that response; whereas in **negative punishment**, the individual loses a stimulus (typically pleasant) contingent on a response. In both cases the future probability of the response decreases. If the coach tells a member of the water polo team that he is disappointed in him for skipping class (i.e., outcome added for skipping the class) and the boy does not skip class any more, we would say that **positive punishment** succeeded in lowering the probability of the boy’s skipping class. On the other hand, if the coach takes away the boy’s playing time for the next match (a loss of pleasant stimuli) and then the boy no longer skips class, the coach has applied **negative punishment**. (See Chapters 29 and 30 for additional details on punishment.) Again, the important thing to remember about the concept of punishment is that it results in a decrease in the behavior of concern. The addition of the qualifiers “positive” and “negative” simply refer to whether a stimulus was added or presented, or subtracted or removed, to produce the particular response. See Figure 2.5 for a comparison of reinforcement and punishment operations.

Beyond noting the immediate consequences of a response, we need to remember that those consequences do not occur in a vacuum. Everyone’s history is unique. Different people come to a given situation with diverse histories of reinforcement and/or punishment, and these histories influence what the person will do at any particular moment. Moreover, these individual histories can also affect what functions as a reinforcer or a punisher for any given person’s behavior under particular conditions. We also need to recognize that reinforcer effective-

<table>
<thead>
<tr>
<th>Stimulus Added</th>
<th>Behavior Increases</th>
<th>Behavior Decreases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive Reinforcement</td>
<td></td>
<td>Positive Punishment</td>
</tr>
<tr>
<td>Negative Reinforcement</td>
<td></td>
<td>Negative Punishment</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Stimulus Removed</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive Punishment</td>
<td></td>
<td>Positive Punishment</td>
</tr>
<tr>
<td>Negative Punishment</td>
<td></td>
<td>Negative Punishment</td>
</tr>
</tbody>
</table>

*Figure 2.5* A comparison of reinforcement and punishment operations
ness is relative in the sense that it is not the person but rather the relation of the reinforced response and the response allowed by the reinforcer that is crucial: you can reinforce drinking with the opportunity to eat, or reinforce eating with the opportunity to drink, depending on the relative deprivations of food and water.

THE ROLE OF ANTECEDENTS ("A"s) IN OPERANT LEARNING

Antecedent Stimuli Defined and Illustrated

Earlier we described how operant behavior usually is set within a three-term contingency. Generally speaking, specific antecedent events or conditions affect behavior by either signaling the nature of the consequences for responding in a given way under the current circumstances, and/or, as in the case of motivating operations (abbreviated “MOs”), by affecting the potency of the consequence. When stimulus control develops naturally, we generally refer to it as a process; when it is programmed intentionally we are more apt to refer to it as a procedure. In either case, stimulus control is demonstrated when an antecedent stimulus is shown to gain control over one or more particular behaviors. (To the outsider, it appears as if the stimulus “causes” the response.)

Next we describe three major types of discriminative stimuli (S^D^s):

1. Those that directly and frequently precede a reinforced response, and eventually come to signal the probability that a given response will be reinforced. For instance, the sound of the lunch bell appears to cause the students to clean off their desks. But actually, having a clean desk formerly has resulted in their being allowed to go to lunch. These S^D^s are labeled positive discriminative stimuli (abbreviated S^D^Ps).

2. A discriminative stimulus for extinction (S^E^) is an antecedent stimulus in the presence of which a particular response fails to result in reinforcement. Mrs. Mack places Jared’s desk next to hers to ensure that he does not gain any extra attention from the other students when he acts silly. Mrs. Mack assumes her desk will become an S^E^ for acting silly, because when Jared behaves that way while sitting next to her desk, he does not receive reinforcement in the form of attention from Mrs. Mack or the other students.

3. The S^D^s that have been associated with a given response having been punished are called stimuli discriminative for punishment (abbreviated S^D^Ps) or negative discriminative stimuli. The S^D^p is a stimulus in the presence of which the individual faces an increased likelihood of receiving punishment for responding in a given fashion. Imagine Dagwood looking up from his computer game during working hours to find his boss, Mr. Dithers standing over him and watching. You can predict what follows: undoubtedly a stream of verbal abuse of the type for which Mr. Dithers has become so notorious. Due to its association with punishment, Mr. Dither’s presence has evolved into a stimulus (an S^D^p) that inhibits or suppresses Dagwood’s playing computer games. (For additional illustrations and an explanation of the differences of these terms and symbols see Chapters 15 and 16.)

The degree of control exerted by antecedent stimuli is on a continuum, from loose to tight. In tight stimulus control, or stimulus discrimination, a given response only occurs in the presence of stimuli in which it has been reinforced in the past (i.e., the person “discriminates” the difference between stimuli). For example, you only open the door when the door bell rings, not when the phone rings. Your door opening can be said to be under tight stimulus control. On the other hand, when you behave under loose stimulus control (referred to as stimulus generalization), responding occurs in the presence of stimuli sharing certain characteristics with those previously paired with reinforcement, as in enthusiastically consuming just about any flavor or brand of ice cream. We might assert that when it comes to ice cream, that individual fails to discriminate the
best ice-cream from the so-so. Technically, the person’s responding generalizes across stimuli.

Here is another example, this time, an amusing personal one. It illustrates the difference between stimulus discrimination and stimulus generalization. In Latin cultures like those prevailing in locales like Miami, it is customary to greet people (social acquaintances as well as close friends and family) by kissing them on the cheek. As a native of Miami, one of the authors was accustomed to greeting just about any social acquaintance that way. (You could say kissing on the cheek was under loose stimulus control). When she entered graduate school in Gainesville, Florida (not a Latin culture) she attended a welcoming party. As she entered the house, she went around kissing everyone in attendance, most of whom were strangers. Their reception of her was rather cool. Needless to say, her kissing behavior quickly diminished in Gainesville and she only greeted people that way when back in Miami. You could say her kissing behavior came under tighter stimulus control. We will elaborate on variations in stimulus control later (in Chapter 16) when discussing in detail how stimulus control develops and functions. For the present, it is important for you to remember that stimulus control can vary appropriately or inappropriately from tight to loose.

**Motivating Operations as Antecedent Events**

Beyond stimuli that influence behavior by signaling consequences, another class of antecedent event exerts control by altering the potency or value of a particular consequence. We call those events “motivating operations” or “MOs.” [MOs also have been labeled establishing operations (EOs), or setting events (SEs)]. Motivating operations are antecedent events that alter behavior by changing the value of a reinforcing and/or discriminative stimulus. Suppose you have not had anything to drink in the past eight hours. This deprivation makes drinking liquids more reinforcing and increases the likelihood of your seeking something to drink, say, by asking for a drink, going over to a water fountain, or other strategies that have produced a drink in the past. Similarly, if you have just eaten a big meal and you are sated, food is less reinforcing, and behavior that has produced food in the past will decrease.

Now admit it! After all this talk about ice cream, are you tempted or did you actually go to the freezer to seek some out? If so, reading about or seeing this enticing picture of ice cream was a motivating operation for you! (You will learn more about MOs in subsequent chapters. Right now I’d better stop. It’s time to make dinner!)

**SUMMARY AND CONCLUSIONS**

Applied behavior analysis (ABA) is designed to address essentially any behavioral challenge(s), including the active or communicative response patterns of any human or non-human client. Essentially, ABA incorporates scientifically derived principles of learning/behave change within its practices, to effectively teach its clientele to alter their behavior in pre-determined ways.

Behavior analysis consists of breaking observable complex behavior down into its functional parts; then reassembling those parts differently. Given its concern with personally and socially important (classes of) behavior, though, applied behavior analysis augments those analytic methods by adding evidence-based change strategies to increase, teach, expand, reduce, or restrict the range of, and to maintain new levels of socially important classes of responses.

Technically, learning consists of altering responses as a function of environmental conditions, while teaching involves promoting change, generally in groupings or operant classes of behaviors. In the case of ABA, as the body of knowledge about principles and methods for promoting effective learning continues to grow, the potential for more effective teaching generally becomes more likely.

Learning takes place in a particular context composed of a multitude of stimuli, and the learned response itself may belong to any of several members of a response class, each of which are affected similarly by a given consequence. By capitalizing on principles of behavior, change agents may apply clusters of antecedents and consequences, or “behavioral procedures,” to produce the results
they are pursuing, in a particular place or across several situations.

Behavior analysts recognize two distinct categories of behavior: respondent (or reflexive) and operant. Pavlov, who pioneered research into respondent behavior, presented the world with an analysis that permitted scientists to understand, and, by rearranging pairings of stimuli, to change respondent/physiological behavior. B. F. Skinner is credited with pioneering the analysis of operant behavior. He and his associates did this by experimentally studying particular patterns of responding implemented prior to and following given behaviors under various sets of conditions. That seminal work eventually began to evolve into systematic efforts toward addressing individuals’ behavioral challenges, as in ABA.

A number of ABA practices have been designed, refined, and thoroughly tested. As you will learn, these include procedures designed to increase behavior (positive and negative reinforcement), reduce behavior (extinction and positive and negative punishment), expand (generalization), or narrow (discrimination) the range of a behavior and maintain changed behavior over time. All of these procedures depend on carefully arranged behavioral consequences and antecedents, often applied under particular environmental circumstances.

As time has passed, ABA practice has continued to become increasingly sophisticated. In the material to follow you will learn how ABA methods are continually improving in their effectiveness, efficiency, credibility, durability, and benevolence. As you begin to master the material, surely you will find yourself contemplating ways to use your newly acquired information as a basis for bettering your own life, along with those of the individuals for whom you share responsibility, and even possibly those of members of the public at large.