pause & reflect

Based on this chapter and your own experience, do you agree that writing objectives and providing them to students are worthwhile uses of a teacher's time? If so, what steps will you take to make writing objectives a standard part of your professional behavior?

As we mentioned at the beginning of the chapter, once you have decided what it is you want your students to learn, you need to decide which approaches you will use to help them achieve those objectives. Our use of the term *approaches* is deliberate. To repeat what we said at the beginning of the chapter, different approaches to instruction are based on different theories of learning and motivation, and given the complexity of the learning process and the diversity of learners in most classrooms, no one theory can be used for all instructional purposes and for all students. So as you read through the next several sections, try to imagine how you might use each approach over the course of a school year.

THE BEHAVIORAL APPROACH TO TEACHING: DIRECT INSTRUCTION

For behavioral psychologists, learning means acquiring new behaviors, and new behaviors are learned because of the role that external stimuli play. Thus a behavioral approach to teaching involves arranging and implementing those conditions that make it highly likely that a desired response will occur in the presence of a particular stimulus (such as reading a sentence fluently, accurately using the correct mathematical operations when faced with a long-division problem, and giving the correct English translation of a paragraph written in Spanish). Perhaps the most popular approach to teaching that is based on behavioral theory is direct instruction.

The Nature of Direct Instruction

The underlying philosophy of **direct instruction** (sometimes called *explicit teaching*) is that if the student has not learned, the teacher has not effectively taught. This approach calls for the teacher to keep students consistently engaged in learning basic skills and knowledge through the design of effective lessons, corrective feedback, and opportunities for practice. It is most frequently used in the teaching of basic skills (for example, reading, mathematical computation, writing) and subject matter (for example, science, social studies, foreign language vocabulary) in the primary and elementary grades. It is also used to teach remedial classes at the middle school and high school levels. It is felt to be most useful for young learners, slow learners, and all learners when the material is new and difficult to grasp at first. Although there are several variations of direct instruction, the following represents a synthesis of descriptions offered by George Adams and Sigfried Engelmann (1996), Bruce Joyce and Marsha Weil (2004), Barak Rosenshine (1987), and Barak Rosenshine and Carla Meister (1994b).

The main characteristics of direct instruction include:

Direct instruction: focus on learning basic skills, teacher makes all decisions, keep students on-task, emphasize positive reinforcement

1. Focusing almost all classroom activity on learning basic academic knowledge and skills. Affective and social objectives, such as improved self-esteem and learning to get along with others, are either de-emphasized or ignored.
2. Having the teacher make all instructional decisions, such as how much material will be covered at one time, whether students work individually or in groups, and whether students work on mathematics during the morning and social studies during the afternoon.
3. Keeping students working productively toward learning new academic knowledge and skills (usually called being on-task) as much as possible.
4. Maintaining a positive classroom climate by emphasizing positive reinforcement and avoiding the use of aversive consequences.

Teachers who subscribe to direct instruction emphasize efficient learning of basic skills through the use of structured lessons, positive reinforcement, and extensive practice.

The goal of direct instruction is to have students master basic skills. Advocates of this method believe that students who mislearn information require substantially more time and effort to relearn concepts than would have been the case had they learned them correctly in the first place.

For obvious reasons, direct instruction is a highly structured approach to teaching and is often referred to as *teacher-directed* or *teacher-led instruction*.

The Components of Direct Instruction

Bruce Joyce and Marsha Weil (2004) identify five general components, or phases, that make up direct instruction: orientation, presentation, structured practice, guided practice, and independent practice. These components are not derived just from theory. They reflect the techniques that effective teachers at all grade levels have been observed to use.

Orientation During the orientation phase, the teacher provides an overview of the lesson, explains why students need to learn the upcoming material, relates the new subject either to material learned during earlier lessons or to their life experience, and tells students what they will need to do to learn the material and what level of performance they will be expected to exhibit.

Presentation The presentation phase initially involves explaining, illustrating, and demonstrating the new material. As with all other forms of instruction based on operant conditioning, the lesson is broken down into small, easy-to-learn steps to ensure mastery of each step in the lesson sequence. Numerous examples of new concepts and skills are provided, and, consistent with social learning theory, the teacher demonstrates the kind of response students should strive for (such as a particular pronunciation of foreign vocabulary, a reading of a poem or story, the steps in mathematical operations, or how to analyze a novel for theme, character, or setting). To assist comprehension, and where appropriate, material can be presented pictorially (as slides, videotapes, on computer) or graphically (as a concept map,

a timeline, or in table form). At the first sign of difficulty, the teacher gives additional explanations.

The last step of the presentation phase is to evaluate students' understanding. This is typically done through a question-and-answer session in which the questions call for specific answers, as well as explanations of how students formulated their answers. Some sort of system is used to ensure that all students receive an equal opportunity to respond to questions. Throughout the lesson, efforts are made to stay on-task and avoid nonproductive digressions.

Structured, Guided, and Independent Practice   The last three phases of the direct instruction model all focus on practice, although with successively lower levels of assistance. Joyce and Weil (2004) refer to these three phases as *structured practice, guided practice,* and *independent practice.* Because the level of teacher assistance is gradually withdrawn, you may recognize this progression as an attempt to apply the behavioral principle of shaping. You may also recognize it as the constructivist principle of scaffolding.

Structured practice involves the greatest degree of teacher assistance. The teacher leads the entire class through each step in a problem or lesson so as to minimize incorrect responses. Visual displays, such as overhead transparencies, are commonly used during structured practice as a way to illustrate and help students recall the components of a lesson. As the students respond, the teacher reinforces correct responses and corrects errors.

During guided practice, students work at their own desks on problems of the type explained and demonstrated by the teacher. The teacher circulates among the students, checking for and correcting any errors.

When students can correctly solve at least 85 percent of the problems given to them during guided practice, they are deemed ready for independent practice. At this point, students are encouraged to practice on their own either in class or at home. Although the teacher continues to assess the accuracy of the students' work and provide feedback, it is done on a more delayed basis.

Getting the Most Out of Practice

Joyce and Weil (2004) offer the following suggestions to help make practice effective:

1. Shape student learning by systematically moving students from structured practice to guided practice to independent practice.
2. Schedule several relatively short but intense practice sessions, which typically produce more learning than fewer but longer sessions. For primary grade students, several five- to ten-minute sessions scattered over the day are likely to produce better results than the one or two thirty- to forty-minute sessions that middle school or high school students can tolerate.
3. Carefully monitor the accuracy of students' responses during structured practice to reinforce correct responses and correct unacceptable responses. The reason for this suggestion comes straight out of operant conditioning research. As you may recall from the chapter on behavioral learning theory, Skinner found that new behaviors are learned most rapidly when correct responses are immediately reinforced and incorrect responses are eliminated. When a learner makes incorrect responses that are not corrected, they become part of the learner's behavioral repertoire and impede the progress of subsequent learning.
4. To ensure the high degree of success that results in mastery of basic skills, students should not engage in independent practice until they can respond correctly to at least 85 percent of the examples presented to them during structured and guided practice.
5. Practice sessions for any lesson should be spread over several months. The habit of some teachers of not reviewing a topic once that part of the curriculum

has been covered usually leads to a lower quality of learning. Once again, distributed practice produces better learning than massed practice.

6. Space practice sessions close together during structured practice but further and further apart for guided practice and independent practice.

Effectiveness of Direct Instruction

George Adams and Sigfried Engelmann (1996) conducted a review of thirty-seven studies of direct instruction and reported strong effects. On average, students who received direct instruction scored at the 81st percentile on an end-of-unit exam, whereas their conventionally taught peers scored at the 50th percentile.

More recent studies of direct instruction have been done in urban schools that enroll high percentages of minority students and students of low socioeconomic status (SES). These studies have produced positive but more modest results. For example, a version of direct instruction called the BIG Accommodation model (because instruction is organized around "big ideas") was implemented in a California middle school that served high-poverty neighborhoods. After one year, the percentage of seventh- and eighth-grade students who were reading at the fifth-grade level or lower declined, whereas the percentage reading at the sixth- and seventh-grade or higher levels increased. Similar results were obtained for math achievement scores. In percentage terms, the most dramatic increase occurred among limited-English-proficient learners. Before the program was implemented, only 10 percent scored at grade level (seventh grade or above) on reading and math tests. One year later that figure rose to about 36 percent. The largest gains in grade equivalent scores were made by White (2.1), American Indian (1.7), and Latino (1.6) students (Grossen, 2002).

Direct instruction helps students learn basic skills

Using Technology to Support Behavioral Approaches to Instruction

The computer-based approach to instruction that uses behavioral learning principles emphasizes specific performance objectives, breaking down learning into small steps, shaping student success, using immediate feedback and consistent rewards, and predefining assessment techniques. Learning is viewed much like an industrial assembly line: information is transferred efficiently from a computer program to a waiting student.

Most of the drill-and-practice computer-assisted instruction tools and integrated learning systems mentioned in the chapter on behavioral learning theory fit within this framework (Mazyck, 2002; Ysseldyke et al., 2003), as would multimedia technology if used simply to embellish a lecture with new pictures or sounds. Although this approach to the use of technology in instruction may be perceived as rote, boring, and dehumanizing, it can prove valuable if you are interested in accurate and efficient learning of basic facts and skills.

THE COGNITIVE APPROACH TO TEACHING: FACILITATING MEANINGFUL AND SELF-DIRECTED LEARNING

The focus of cognitive learning theories is the mind and how it works. Hence, cognitive psychologists are primarily interested in studying those mental processes that expand our knowledge base and allow us to understand and respond to the world differently. In this section, we will lay out two approaches to instruction that are

based on different forms of cognitive theory: information processing and constructivism. The information-processing approach to teaching involves implementing those conditions that help students effectively transfer information from the "outside" (a text or lecture, for example) to the "inside" (the mind), whereas the constructivist approach focuses on providing students opportunities to create their own meaningful view of reality.

The Nature and Elements of an Information-Processing Approach

As we noted previously in the book, information-processing theory focuses on how human beings interpret and mentally manipulate the information they encounter. Research shows that, for information to be meaningfully learned, it must be attended to, its critical features must be noticed, and it must be coded in an organized and meaningful way so as to make its retrieval more likely (Joyce & Weil, 2004; Marx & Winne, 1987; Pressley, Woloshyn, & Associates, 1995).

The approach to teaching that flows from information-processing theory has two main parts. First, design lessons and gear teaching behaviors to capitalize on what is known about the learning process. As you will see, this part of the information-processing approach has much in common with the behavioral approach that we just covered. Both approaches direct you to structure the classroom environment in a certain way (and to use some of the same tactics) to improve the effectiveness and efficiency of learning. Second—and this is what makes the information-processing approach unique—make students aware of how they learn and how they can use those processes to improve their classroom performance. Following are several suggestions for helping students become more effective processors of classroom instruction.
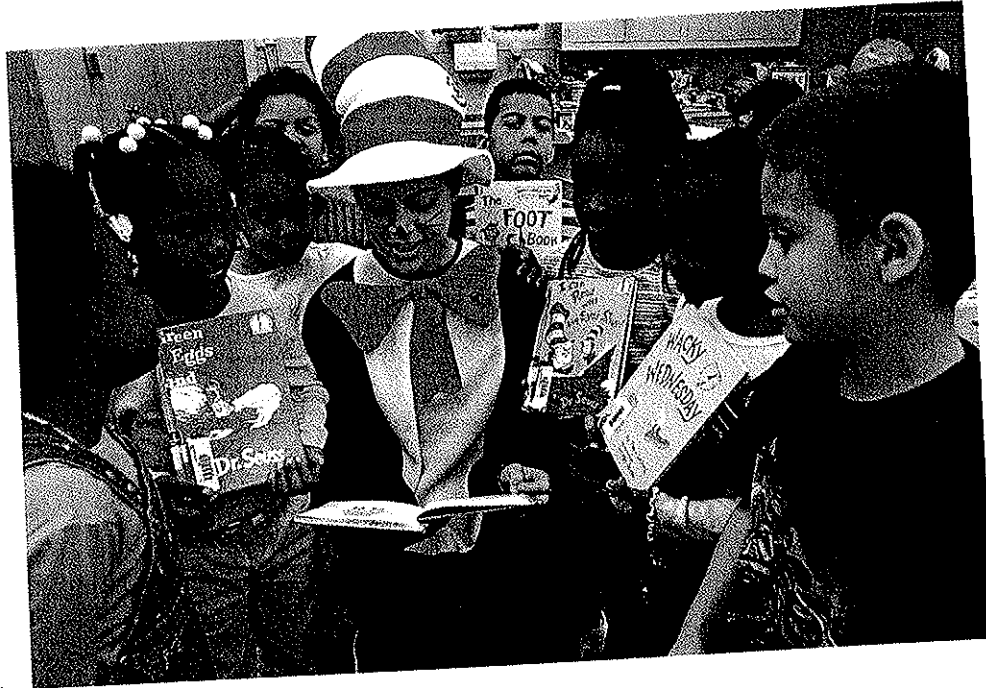
> Information-processing approach: design lessons around principles of meaningful learning, teach students how to learn more effectively

Communicate Clear Goals and Objectives In previous chapters, we pointed out that motivation for learning is highest when students can relate new information to what they already know and to out-of-school experiences. The ability to make these links is what makes learning in general, and school learning in particular, meaningful. The first question that students ask themselves when they take a new course, encounter a new topic, or are asked to learn a new skill is, "Why do I have to learn this?"

Unfortunately, many teachers seem unaware of the need to explain clearly to students the immediate and larger purposes of learning most of a school's curriculum. Seymour Sarason (1993), who has written extensively and persuasively about the problems of education (including teacher education) and the need for reform, notes that "although that kind of question occurs to every child, I have never heard a student ask that question out loud, just as I have never observed a teacher address the issue" (p. 224). But some teachers do recognize the value of communicating clear goals. Margaret Metzger (1996), a veteran high school teacher, notes that teachers have to convince students that what they learn in school is important and relevant to their lives outside school, both now and in the future.

At the beginning of each lesson, tell students what you want them to accomplish, why you think it's important that they learn this knowledge or skill, and how you are going to assess their learning. If you intend to use paper-and-pencil tests, tell them what content areas will be covered, what kinds of questions you will include (in terms of the levels of Bloom's Taxonomy), and how many of each type of question will be on the test. Without this information, students will be unable to formulate a rational approach to learning and studying because they will be forced to guess about these features. They may, for example, take your general directive to "learn this material for the test" as a cue to memorize, when you expected them to be able to explain ideas in their own words. If you intend to use performance measures, tell students the conditions under which they will have to perform and what criteria you will use to judge their performance.

> **JOURNAL ENTRY**
> Using an Information-Processing Approach to Instruction

> Tell students what you want them to learn and why, and how they will be tested

One implication of the information-processing approach to instruction is to use attention-getting devices since information not attended to will not be learned.

Use Attention-Getting Devices   Information-processing theory holds that material not attended to is not processed, and material that is not processed is not stored in memory. Consequently, you should use (but not overuse) a variety of attention-getting devices. The suggestion we just made to explain the purpose of a lesson, what students will be held accountable for learning, and how student learning will be assessed will likely capture the attention of some students. But once you are into a lesson, you may need to gain and maintain students' attention repeatedly.

The first Suggestions for Teaching in Your Classroom section ("Helping Your Students Become Efficient Information Processors") in Chapter 8, "Information-Processing Theory," mentioned a few devices for capturing students' attention. Here are several more:

- Orally emphasize certain words or phrases by raising or lowering your voice.
- Use dramatic gestures.
- Underline key words and phrases that you write on a chalkboard or whiteboard.
- When discussing the work of important people, whether in science, math, social studies, or history, dress up to look like the person and speak as you think the person might have spoken.

Emphasize Organization and Meaningfulness   Research studies have repeatedly found that students learn and recall more information when it is presented in an organized format and a meaningful context. Information is organized when the components that make it up are linked together in some rational way. If you teach high school physics, you can organize material according to major theories or basic principles or key discoveries, depending on your purpose. For history, you can identify main ideas and their supporting details or describe events as a chain of causes and effects. Just about any form of organization would be better than having students memorize names, dates, places, and other facts as isolated fragments of information.

A popular method for organizing and spatially representing the relationships among a set of ideas is *concept mapping* (as we noted earlier in Chapter 9, "Social Cognitive Theory"). This technique involves specifying the ideas that make up a

Present organized and meaningful lessons

Figure 11.2 Two Concept Maps Constructed from Identical Concepts
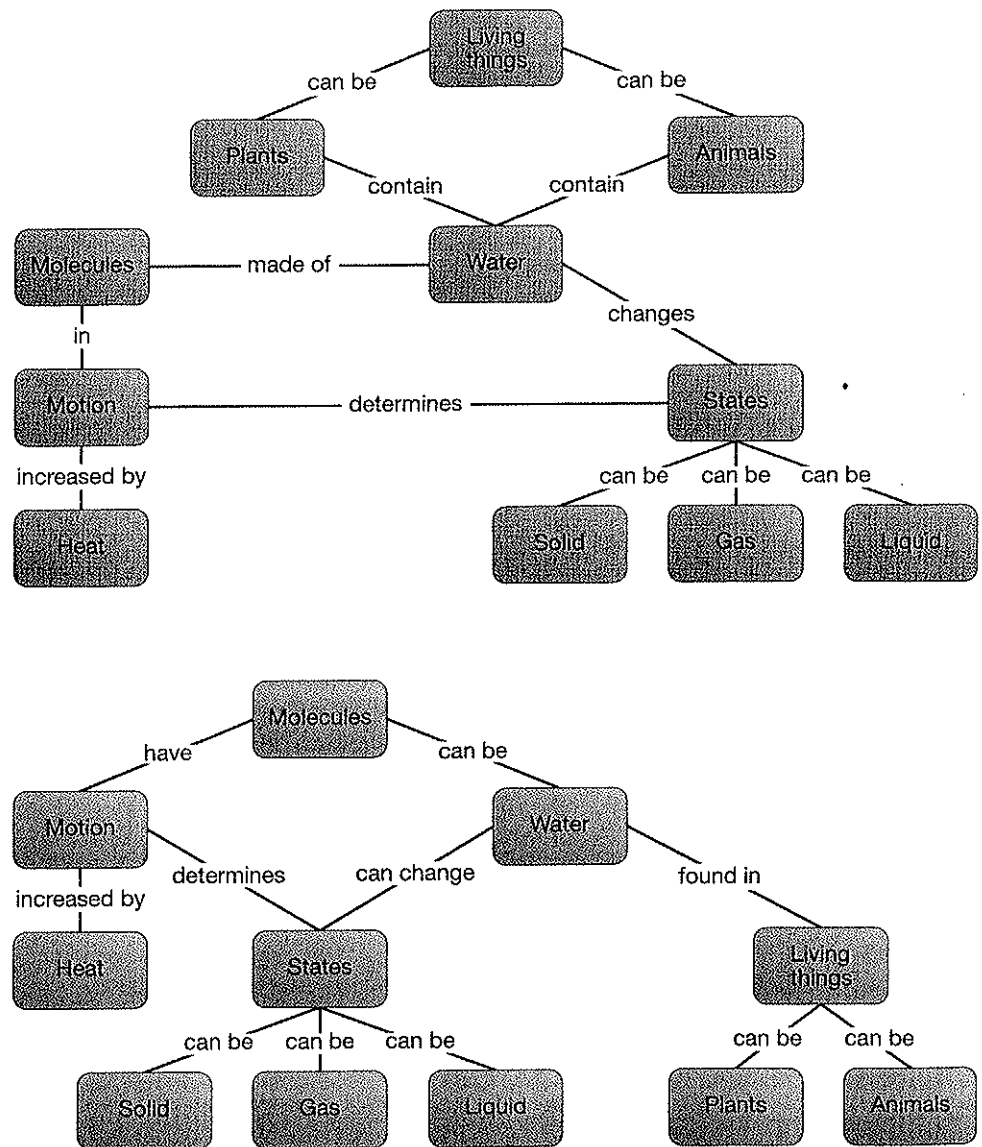
SOURCE: Novak and Gowin (1984).

topic and indicating with lines how they relate to one another. Figure 11.2 is a particularly interesting example of both organized knowledge and a constructivist view of learning. (We will take a further look at this latter angle when we discuss constructivist approaches.)

As we pointed out in Chapter 8, meaningful learning results in richer and more stable memory representations and occurs more readily when information can be related to familiar ideas and experiences. Several techniques are known to facilitate meaningful learning:

• Using some form of overview or introduction that provides a meaningful context for new material
• Using concrete examples and analogies to illustrate otherwise abstract ideas
• Using visually based methods of representing information, such as maps, graphs, three-dimensional models, and illustrations

- Stressing practical applications and relationships to other subjects (you may recall from a previous chapter that this tactic is used to help adolescent girls remain interested in science)

Present Information in Learnable Amounts and Over Realistic Time Periods

When students struggle to master the information they are expected to learn, the problem sometimes arises simply from an excess of information being presented to them at once—that is, from too great an external demand. At other times, the student's working (short-term) memory is strained because of the nature of the task itself: for instance, if the task has several components that all have to be monitored. By taking the nature of the task into consideration, you can judge how much information to expect your students to learn in a given time.

For tasks in which a set of discrete elements must be learned in a one-at-a-time fashion, such as learning foreign language vocabulary or the symbols of chemical elements, the demand on working memory and comprehension is low because the elements are independent. Learning the meaning of one word or symbol has no effect on learning any of the others. As long as the external load on working memory is kept reasonable by limiting the number of words or symbols that students have to learn at any time, learning problems should be minimal.

Other tasks make greater demands on working memory because their elements interact. Learning to produce and recognize grammatically correct utterances ("The cat climbed up the tree" versus "Tree the climbed cat up the") is a task that places a higher demand on working memory because the meaning of all the words must be considered simultaneously in order to determine if the sentence makes sense. For such tasks, keeping the amount of information that students are required to learn at a low level is critically important because it leaves the student with sufficient working memory to engage in schema construction (Sweller et al., 1998).

One instructional recommendation that flows from this analysis is the same as one of the recommendations for direct instruction: break lessons into small, manageable parts and don't introduce new topics until you have evidence that students have learned the presented material. A second recommendation is to build into lessons opportunities for students to write about, discuss, and use the ideas they are learning. By monitoring the accuracy of their responses, you will also have the information you need to judge whether it is time to introduce new ideas. Finally, arrange for relatively short practice sessions spread over several weeks rather than one or two long practice sessions, because distributed practice leads to better learning than massed practice.

> **Present new information in small chunks**

Facilitate Encoding of Information into Long-Term Memory

High-quality learning rarely occurs when students adopt a relatively passive orientation. As we pointed out in Chapter 8, many students do little more than read assigned material and record ideas in verbatim form. They spend little time thinking about how ideas within topics and between topics relate to one another or to concepts they have already learned. One reason is that many students simply do not know what else to do with information. Another reason is that teachers do little to support the kind of encoding that results in more meaningful forms of learning. Recall the study we mentioned that found that teachers in primary grades through middle school provided students with suggestions for processing information less than 10 percent of the time and with explanations for the suggestions they did give less than 1 percent of the time. To help your students encode information for more effective storage in and retrieval from long-term memory, incorporate the following techniques into your classroom instruction:

- Present information through such different media as pictures, videotape, audiotape, live models, and manipulation of physical objects.