Chapter 10

Instructional Management

This chapter will help you answer the following questions about your learners:

• How can I use goals to motivate and energize my learners?

• How can I write objectives at higher levels of behavioral complexity, such as analysis, synthesis, and decision making?

• What are some of the ways to capture student interest at the start of a lesson?

• How do I teach by modeling?

• How can I conduct an effective demonstration?

• How can I help students take responsibility for their own learning?

• What can I do to make my learners look forward to practicing their skills?

• How can prompts be used to help guide learners to a first response?

• What are some ways to use questions to encourage learners to respond correctly?

• How can technology make independent practice and transfer a practical classroom goal?

• How can I help my learners transfer what I teach to new situations and settings?

In this chapter you will also learn the meanings of these terms:

  anticipatory set

  coaching
commanding stimuli appeal
direct instruction
discrepancy appeal
emotional appeal
fading
goals
guided practice
independent practice
indirect instruction
instructional events
instructional management
modeling
objectives
prompts
psychophysical appeal
self-directed instruction
structuring
transfer of learning

Lori Freeman heads the science department at Sierra Blanca Junior High School. She has been teaching courses in physical science, life science, and ecology for 16 years to a diverse group of seventh- and eighth-grade learners, mostly from working-class and lower middle-class families. Both she and her colleagues will tell you that Ms. Freeman is as excited about her subject and her students as she was on her first day of teaching.

It is the second week in February, and Ms. Freeman is teaching a unit on photosynthesis. Years ago an experienced teacher advised Ms. Freeman to plan her most exciting units between Christmas and Easter, the time of year when both students and faculty experience the winter doldrums. Following this advice, Ms. Freeman has
given a lot of thought to her goals, objectives, and instructional activities for this unit. Rather than start the first lesson with a presentation on the importance of food for plants, Ms. Freeman decides that a discussion on food for people would be more interesting. She begins to engage her class of 28 learners in a dialogue about which of a variety of substances can be considered food. Her students are seated in groups of five or six with their attention drawn to an overhead transparency of a prepared list of substances. Ms. Freeman begins with a brisk pace of questions, clarifications, and explanations while moving about the room to keep her students’ attention.

The class has little trouble agreeing that substances like carrots, milk, and potatoes are food. But the class is puzzled over whether water is food. Ms. Freeman lets the debate continue for a few minutes and then changes the overhead to a definition of food, which reads, *Food: substances that contain energy in the form of calories for living things.* After a brief explanation, she asks the students to record the definition in their notebooks. Then Ms. Freeman returns to the issue of whether water is food, given the definition they have just seen. Most students agree that water is not food. Carla, however, remains unconvinced, calling out, “It’s a kind of food.” Some heated discussion follows, but the issue remains unresolved as Ms. Freeman ends the lesson with instructions to copy the next day’s assignment from the board.

The following day Ms. Freeman decides to review the previous day’s discussion by asking if there are any questions. Carla states that her older brother, who is a college student, told her that food has to have calories and pointed out that water doesn’t have any. “So I guess water isn’t food,” she explains to the class.

Carla’s comments about water provide a transition to a brief explanation and discussion about the role of water in our lives. Ms. Freeman turns on the overhead again and asks the students several questions about how plants get food. The students are puzzled at first. Then someone blurts out, “We fertilize them.” Another says that
his parents insert little food sticks in the potted plants at home. Each student response is recorded on the transparency.

“Well, do the plants reach out and grab these food sticks and munch on them like some kind of snack?” challenges Ms. Freeman. The class laughs, but most are still puzzled. Ms. Freeman then asks them to write in their notebooks their thoughts about how plants get food. She gives them about 10 minutes, during which time she moves about the room checking work, answering and asking questions, encouraging more complete answers, and reminding them of the facts they have learned. Two minutes before the activity is to end, she reminds them to finish their work.

“OK, now let’s have some of your ideas,” Ms. Freeman asks. She writes on the transparency How Plants Get Food. “Tell me what you wrote. How do you think plants get food? Donald?” Ms. Freeman lists Donald’s ideas: carbon dioxide from the air, light from the sun, oxygen from the air, minerals from the soil or from food sticks, water from rain.

In the ensuing discussion, Ms. Freeman guides her students to the understanding that plants make their food through the minerals they absorb from water. As the lesson ends, Ms. Freeman makes the association between what they have just learned and the process of photosynthesis. Subsequent explanations and laboratory tasks provide examples and real-life demonstrations of the process of photosynthesis.

Introduction

Educational psychologists have always focused much attention on identifying what successful teachers like Ms. Freeman do to promote student learning. By analyzing the classroom behavior of effective teachers, researchers have identified certain regularly occurring patterns of teacher behavior. These patterns of expert practice are evident regardless of whether the subject is reading, science, social studies, math, art, or any other subject.
Ms. Freeman’s lesson did not just happen. It was undoubtedly the result of much hard work and self-reflection. Nor is it likely that any other teacher could have substituted for her on this day and achieved the same kind of interaction between teacher and learners. This lesson went smoothly because it was part of a much larger pattern of practice that extended across the entire school year. What was this pattern of practice?

Ms. Freeman’s pattern of practice involved many different aspects of teaching. Included among them were the principles of group management we discussed in Chapter 8. Her learners felt secure enough to express their own ideas and to disagree with the viewpoints of others because Ms. Freeman had taken the time to develop high expectations for all her students, classroom norms that value learning and group cohesiveness.

Included also in Ms. Freeman’s pattern of practice were rules and routines of conduct management, discussed in Chapter 9. Her learners moved smoothly from one activity to another, listened to Ms. Freeman and to each other, and spoke at appropriate times because of the conduct management procedures Ms. Freeman already had in place.

But in addition to her expertise in group and conduct management, Ms. Freeman also showed a pattern of expert practice that we will refer to as instructional management. This includes two broad components of teaching skill: (1) expertise in planning for instruction and (2) expertise in delivering instruction. Before teaching her lesson, Ms. Freeman had made important planning decisions about its goals and objectives. These goals and objectives gave Ms. Freeman and her learners a purpose or reason for the activities they were pursuing. They also made it easier to gauge the learners’ progress.

Finally, Ms. Freeman and her learners were able to achieve their goals and objectives because of her expert pattern of practice in delivering instruction. As you will learn in this chapter, the effective delivery of instruction includes four general categories of teaching skills: (1) structuring, (2) modeling, (3) coaching, and (4) fading.

One of your goals as a beginning teacher will be to build successful patterns of practice in your classroom. These will involve the learning climate you create, the classroom
management procedures you establish, the goals and objectives you choose, and the teaching
activities of structuring, modeling, coaching, and fading you employ to achieve a positive
impact on your learners. By carefully studying this chapter and observing patterns of expert
practice during your field placements and student teaching, you will be able to build
successful patterns of practice. When these activities become enriched with an understanding
of learner assessment (to be discussed in Part IV), you will have acquired the patterns of
expert practice of an effective teacher.

Goals: Giving Instruction a Purpose

Since I began teaching, my English 9B classes have been one struggle after the next.
Not only do all of my students have distinct personalities, but they have a variety of
skill levels as well. When I announced we would be reading *Romeo and Juliet*, some
students—mostly girls—rejoiced at the prospect. Others groaned, “Why?” It was more
a plea than a question. “Because,” was my response, “*Romeo and Juliet* is required
reading for all ninth graders as stated in the curriculum guide.”

Meaningless. They didn’t buy it. That was my first mistake. I had not really thought
about why I was teaching the play. I only knew that I was going to teach it because the
guide said so, and I had not anticipated that the majority of my students would want to
know why. (Vickie White, in Shulman, 1991, p. 28)

Since your students will silently ask themselves “Why do I have to learn this stuff?” it is
only reasonable to ask “Why am I teaching it?” There are several ways to answer this
question. One is that you are teaching a lesson so that your students can attain a certain
outcome—recognize the sounds of consonant blends, add two-digit numbers, or focus a
microscope. This answer involves the identification of the behavioral outcomes your learners
will acquire at the end of your lesson. But such an explanation says little about the importance
of the behavior or skill you want your students to attain. Imagine answering Vickie’s
students’ question about why they have to learn “this stuff” with the answer “So you’ll know
about Romeo and Juliet!” We know what will follow: “But why do we have to know that?” Vickie’s students will continue to search for a purpose or meaning for the activity she has chosen. Finding none, they will disengage themselves from her lesson.

The Relevance of Educational Goals

Educational goals provide a sense of mission and purpose. The more aware you are of your mission and purpose in teaching an area of content, the more you will be able to inspire your students to learn it, unlike Vickie, who was unable to relate what she was teaching to a larger purpose that could be understood by her students. Your ability to articulate goals conveys to learners your sense of purpose, from which they can make a commitment to learn. This is why goals are important—they energize and motivate students to become actively engaged in and committed to the learning process. The accompanying box, *Writing Instructional Goals*, gives examples of goals that might energize students to make a commitment to learn. As you read them, reflect on how well they answer the question “Why am I teaching this?”

Notice that these goal statements, although written for the teacher, are expressed from the learner’s point of view. In other words, goals identify what your students will learn from your instruction. For example, the statement “The teacher will show students examples of logical arguments” would fail as an educational goal because it describes what you will do, not what your students will learn. “Learners will acquire the ability to construct a convincing argument” qualifies as a goal statement because it identifies what is expected of your students.

How do you choose goals for learners? What is the best way to find proper goals, given the diversity and complexity that exist across subjects and grades? Several approaches to formulating educational goals have been developed to help you. One approach comes from the work of Tyler (1974).
Tyler’s Goal Development Approach

Tyler’s approach to generating educational goals has had a major influence on curriculum development over the past three decades. Tyler believes that as society becomes more complex there are more things for people to learn. But the time available to learn this ever-expanding amount of knowledge and skills continually decreases. Consequently, educators must make informed choices about which goals are worth teaching.

Tyler identified five factors to consider when a teacher establishes priorities for what students should learn. First, goals must include:

- the subject matter we know enough about to teach (subject matter mastery)
- societal concerns, which represent what is valued in both the society at large and the local community
- personal interests of the students, and the abilities and knowledge they bring to school.

Second, these goals must be refined to match

- your school and community’s educational philosophy
- what instructional theory and research tell us can be taught.

Tyler’s approach to establishing educational goals is illustrated in Figure 10.1.

From Educational Goals to Classroom Accomplishments

Broad educational goals can provide direction for unit and lesson planning, communicate the importance of your instruction to administrators and parents, and energize your learners to higher levels of commitment and performance. They can also provide a practical framework around which to organize and sequence your instruction.

While goals answer the question “Why am I teaching this?” they do not specify what or how you will teach on any given day. Goals give you little direction as to what strategies you
might use to achieve them and do not indicate when—or even if—they are met. A satisfactory answer to these questions requires the preparation of lesson objectives.

**Objectives: Giving Goals a Direction**

As we have seen, identifying educational goals is the first step in unit and lesson planning. In the course of your teaching, you will be responsible for preparing and managing extended sequences of instruction, called *units*, and day-by-day activities, called *lessons*. Units comprise interrelated sequences of lessons, which may cover one, two, or more weeks of instruction. Lessons represent the content for a single class day. Table 10.1 shows a portion of the content outline from a middle school science text, *Earth Science* (Addison-Wesley, 1987). Let’s look at what it offers as a guide to unit and lesson planning—and what it doesn’t offer!

Content outlines like that in Table 10.1 are useful for identifying topics to be covered in a unit or lesson. However, they typically do not provide information about the more fundamental issue of what your students must do with what they have learned. In other words, will you expect your students to recall important facts, such as definitions of weathering and erosion? Or will you expect your students to master such concepts as fault, plate tectonics, and continental drift? Or is the purpose of your unit to teach students to acquire important generalizations concerning the relationship between plate tectonics, faults, and earthquakes and use these generalizations to problem solve?

Deciding what you want your students to accomplish during a lesson or unit of instruction requires answering the following questions:

- What knowledge or content (facts, concepts, principles, rules) is essential for learner understanding of the subject matter?
- What intellectual skills are necessary for the learner to use this knowledge or content?
- What habits of mind or attitudes are important for learners to perform successfully with this knowledge or content?
To help you answer these questions, we will consider the work of two psychologists, Robert Gagné and Benjamin Bloom, whose ideas have significantly shaped our understanding of how the mind works. Most importantly, their ideas have contributed to a design for unit and lesson planning that moves teachers from an exclusive focus on self—what you will do—to a concern for your impact on learners—what your students will be able to accomplish. Let’s look at what each of them has to say.

Gagné's Classification of Learning Outcomes

According to Gagné, the precise identification of a learning outcome is the first step in the learning process. This allows the teacher to determine the prerequisite skills for that outcome and to arrange these skills in the form of a learning hierarchy (a process called task analysis). As you will recall from Chapter 4, a learning hierarchy is an arrangement of behavioral outcomes or motor skills (action sequences), from the most complex at the top of the hierarchy to the least complex at the bottom.

To develop a learning hierarchy, you must first identify a learning outcome. Gagné has classified learning outcomes into five types: verbal information, intellectual skills, cognitive strategies, attitudes, and motor skills (see Table 10.2). As you study a curriculum guide or content outline for the subject you will teach, you can categorize your expectations for learners into one or more of these five learning outcomes.

Classifying a particular learning outcome into its proper category helps you develop learning hierarchies. Figure 10.2 presents the general structure of a learning hierarchy, which usually takes the form of a pyramid, with higher-order outcomes (for example, a cognitive or problem-solving strategy) at the apex and more basic learning outcomes (for example, verbal information) at the base. Attitude and motor skills may be taught at any level of the hierarchy and then reinforced as more complex learning evolves. Each lower level of the hierarchy is a prerequisite to achieving a higher level of learning.
Thus, according to Gagné, a successful problem solver must first learn the important facts, concepts, and principles of which the problem is composed. Likewise, a learner finds it impossible to acquire a principle, for example, unless he or she has first learned the concepts to which the principle applies. Concept learning, in turn, requires the learner to “memorize” bits of information in order to be able to put them together in a meaningful way to form the concept.

In Table 10.3 we return to our earth science curriculum outline to illustrate how a hierarchy of learning can help answer the question “What do I want my students to do with what I’ve taught?” What you are to teach has been given you by the textbook and curriculum guide; what you want your students to be able to do has yet to be defined. Study the examples of behavioral outcomes at each level of the hierarchy in Table 10.3 to see whether they define what the learner should be able to do.

The learning hierarchy illustrated in Figure 10.2 shows which types of learning are required before other, more complex learning can take place. Imagine how frustrated your students would be if you were to teach plate tectonic theory without first teaching them the concepts they need to understand it. Gagné’s hierarchy demonstrates that much of the subject matter taught in schools can be placed in the form of a hierarchy of learning, such as the one illustrated in Table 10.3 and Figure 10.2. Consequently, as a teacher you must ensure that whichever type of learning you want your learners to acquire, they have been given the prerequisite knowledge or skills to achieve it.

Depending on what type of learning (memorization, concepts, principles, or problem solving) you expect your students to master, there are more or less effective techniques and activities to teach it. For example, you will use different instructional methods to help learners acquire concepts than you will to help them form generalizations or to problem solve. The accompanying box, Matching Instructional Approaches to Learning Outcomes, indicates some of the instructional approaches that classroom researchers (Brophy, 1986;
Brophy & Good, 1986; Clark & Peterson, 1986) have found effective in helping learners acquire different learning outcomes.

Bloom's Analysis of Learning Outcomes

Gagné’s analysis of learning illustrates the diversity of expectations we can have for learners. Nevertheless, his categories of learning are broad and do not indicate specific behaviors that indicate whether learners are acquiring verbal information, forming concepts, applying generalizations, problem solving, or developing positive attitudes.

Bloom and colleagues, and others (Bloom, Englehart, Hill, Furst, & Krathwohl, 1956; Harrow, 1969; Krathwohl, Bloom, & Masia, 1964), have developed systems for classifying learning outcomes and identifying behaviors that can be expected of learners. These systems lend greater specificity to the work of Gagné. These authors refer to their respective classification schemes as taxonomies of behavioral objectives, since they are intended as targets or goals of instruction. Accordingly, they have categorized objectives into three domains: the cognitive domain, which represents intellectual abilities and skills, including those identified by Gagné; the affective domain, which represents attitudes, beliefs, and values; and the psychomotor domain, which represents bodily movement and physical performance.

The taxonomy of cognitive objectives is specifically associated with the work of Bloom et al. (1956). Like Gagné, these authors assume that the levels of their taxonomy are hierarchical. That is, higher-level mental operations are assumed to include, and to be dependent on, lower-level operations. Each level of the taxonomy of cognitive objectives has different characteristics and includes action verbs to represent the mental processes that represent them. Table 10.4 identifies and describes the levels included in the affective and psychomotor domains.
Bloom’s cognitive domain includes six levels: knowledge, comprehension, application, analysis, synthesis, and evaluation. In the following sections we describe each level of the cognitive domain.

Knowledge. Objectives at the knowledge level require learners to remember or recall information such as facts, terminology, problem-solving strategies, and rules. Some action verbs and examples that describe learning outcomes at the knowledge level are:

- define
- list
- identify
- recognize
- select
- state
- label
- match
- name

For example, the following learning outcomes are included in the knowledge domain:

- The student will state the four major food groups, without error, by Friday.
- From memory, the student will match United States generals with their most famous battles with 80 percent accuracy.

Comprehension. Objectives at the comprehension level require some degree of understanding. Learners are expected to be able to change the form of a communication, translate, restate what has been read, see connections or relationships between parts of a communication (interpretation), or draw conclusions from information or see the consequences of it (inference). Some action verbs that describe learning outcomes at the comprehension level are:

- defend
- summarize
- infer
- explain
- estimate
- predict
- extend
- distinguish
- paraphrase

Here are some examples of learning outcomes at the comprehension level:
d By the end of the semester, the student will *summarize* the main events of a story in grammatically correct English.

d The student will *distinguish* between the realists and the naturalists, citing examples from the readings.

Application. Objectives written at the application level require the learner to use previously acquired information in a setting other than the one in which it was learned. Application differs from comprehension in that application requires the presentation of a problem in a different and often applied context. Thus, the student can rely on neither the content nor the context in which the original learning occurred to solve the problem. Some action verbs that describe learning outcomes at the application level are:

- change
- compute
- modify
- prepare
- use
- solve
- relate
- demonstrate
- organize

Some examples of application-level objectives are:

d On Monday, the student will *demonstrate* for the class an application to real life of the law of conservation of energy.

d Given equations not covered in class, the student will *solve* them on paper with 85 percent accuracy.

Analysis. Objectives written at the analysis level require the learner to identify logical errors (for example, point out a contradiction or an erroneous inference) or to differentiate between facts, opinions, assumptions, hypotheses, and conclusions. At this level, students are expected to draw relationships between ideas and to compare and contrast. Some action verbs that describe learning outcomes at the analysis level are:

- deduce
- break down
- relate
Some examples of objectives written at the analysis level are:

- Given a presidential speech, the student will be able to point out the positions that attack an individual rather than that individual’s program.
- Given absurd statements (for example, “A man had the flu twice. The first time it killed him. The second time he got well quickly.”), the student will be able to illustrate the contradiction.

Synthesis. Objectives written at the synthesis level require the learner to produce something unique or original. At the synthesis level, students are expected to solve an unfamiliar problem in a unique way or to combine parts to form a unique or novel solution. Some action verbs that describe learning outcomes at the synthesis level are:

- compile
- create
- develop
- devise
- predict
- produce
- compose
- design
- formulate

Following are some objectives written at the synthesis level:

- Given a short story, the student will formulate a different but plausible ending.
- Given a problem to be solved, the student will design on paper a scientific experiment to address the problem.

Evaluation. Objectives written at the evaluation level require the learner to form judgments and make decisions about the value of methods, ideas, people, or products that have a specific purpose. Students are expected to state the bases for their judgments (for example, the criteria or principles they used to reach their conclusions). Some action verbs that describe learning outcomes at the evaluation level are:
Following are some objectives written at the synthesis level:

d Given a previously unread paragraph, the student will judge its value according to the five criteria discussed in class.

d Given a description of a country’s economic system, the student will defend it, basing arguments on principles of democracy.

Delivering Instruction

In the previous section you learned about the importance of specifying goals and objectives for your learners. We pointed out that goals energize you and your students to achieve high degrees of effort and learning. We discussed how objectives specify what students are expected to do to demonstrate learning.

There is another important use for goals and objectives: they can determine your choice of instructional methods. Simply stated, instructional methods are patterns of practice that recur in classrooms time and again. They include, for example, the methods of direct (or didactic) instruction, indirect (or inquiry) instruction, and self-directed (or self-regulated) instruction. Each of these general methods includes certain specific teaching skills, among which are structuring, modeling, coaching, and fading. These skills are described in Table 10.5 together with the instructional methods with which they are most commonly used.

For instance, if your objective is to have students acquire facts (for example, names and dates of battles of the Civil War), rules (for forming possessives), or action sequences (for focusing a microscope), you will most likely use direct instruction, which involves some questioning, clarifying, and explaining. But if your objective is to teach concepts (for example, photosynthesis), patterns (global warming), or abstractions (environmental
responsibility), you will most likely use **indirect instruction**, which involves constructivist teaching methods discussed in Chapter 5. If, however, your objective is to teach strategies for learning (for example, a model for learning to solve equations that can be used time and again), you will most likely adopt the method of **self-directed instruction**, which incorporates the skills of metacognition (thinking about thinking), subvocal rehearsal, guided practice, and self-evaluation that you learned about in Chapter 5. In this chapter we will study each of these general instructional methods and the specific teaching skills they require.

As noted in Table 10.5, our three instructional methods require the four specific teaching skills of structuring, modeling, coaching, and fading. Specific teacher behaviors used in executing each of these skills are identified in Figure 10.3. Regardless of the instructional method you are using, you will want to be familiar with structuring, modeling, coaching, and fading. As you look across the rows of Table 10.5, you will find that while each method requires the same teaching skills, these skills are used for different purposes. For example, the direct instruction method calls on the teacher to use modeling to help learners acquire facts, rules, and action sequences, such as those required by certain motor skills. By comparison, the self-directed method requires that the teacher draw on his or her expertise in modeling to show learners how to think about their own thinking in order to acquire a strategy for learning. In the next section, we will study the teaching skills of structuring, modeling, coaching, and fading. We will demonstrate how successful teachers use these skills to capture student attention, convey purpose, communicate information, keep lessons moving at a brisk and lively pace, and provide opportunities for transferring what has been learned to new and different contexts.

The Events of Instruction

**Instructional events** are key elements of the teaching process that allow learners to acquire and transfer new information and skills. Gagné, Briggs, and Wagner (1992) suggest nine key instructional events:
1. Gaining attention
2. Informing the learner of the objective
3. Stimulating the recall of prerequisite learning
4. Presenting the stimulus material
5. Guiding learning
6. Eliciting the desired behavior
7. Providing feedback
8. Enhancing retention
9. Promoting transfer

Hunter (1982) proposes a similar sequence of events, called the *mastery teaching program*. According to Hunter, the key instructional events are these:

1. Review
2. Anticipatory set
3. Objectives and purpose
4. Input and modeling
5. Checking for understanding
6. Guided practice
7. Closure
8. Independent practice and reteaching

Recently, there has been debate over whether the events of instruction, as outlined by Gagné, Briggs, and Wagner and by Hunter, are appropriate only for the learning of the facts, rules, and action sequences often taught with the direct instructional method. Slavin (1991), for example, states that instructional sequences such as Hunter’s may be inappropriate when the objectives of instruction deal with inquiry or problem solving, which often are the focus
of indirect instruction. However, regardless of the goals or objectives of instruction, certain key teaching activities should occur across methods if learning is to be acquired and transferred.

Table 10.6 shows how the key teaching skills of structuring, modeling, coaching, and fading compare with the instructional events of Gagné, Briggs, and Wagner and of Hunter. Notice that these teaching skills apply not only to the instructional events of these authors but also to each of our three general instructional methods.

The Expert Practice of Structuring

**Structuring** is the process of getting learners ready to learn by selecting, organizing, and previewing the content to be presented. Structuring is that part of a lesson during which the teacher exerts the most control over the learning process. During structuring, it is essential that the teacher be skilled at capturing the attention of learners and focusing it on the outcome of the lesson. If not fully alert, learners will find it difficult to remember the information given, understand the goal of the lesson, or participate in the instructional process—all of which are essential for learning and transfer to occur.

How do you gain a learner’s attention? Your voice, your actions, and your visual displays have to compete with hundreds of other stimuli that also are vying for your learners’ attention. How can you get students to attend? What does it mean to “pay attention”?

Learners who pay attention usually demonstrate several skills.

- They orient themselves to you and what you direct them to (for example, the overhead projector, the blackboard, the text).
- They focus their attention on the relevant aspects of what they are attending to (for example, the problem you are describing, the responses of another student, the picture in the text).
They ignore distracting stimuli (for example, another student or the sounds of a nearby classroom).

They remain alert during the lesson (for example, they maintain their engagement with the lesson despite a desire to return to a more passive state).

Structuring focuses learners on the first two of the skills above. These involve (1) focusing attention by directing the eyes, ears, and body posture of learners to a relevant stimulus and (2) holding their attention long enough to establish a learning set. We will explore the third and fourth attention-gaining skills under the expert practice of coaching. For now, let’s turn to the first two skills: focusing and holding your learners’ attention.

Focusing Attention. Before you can communicate the purpose or objective of a lesson, you must focus the eyes and ears of your learners. This is difficult at the start of class if your learners are taking out materials, finishing their homework, asking questions of one another, or catching up on the latest gossip with their friends.

Research on attention has focused on four properties of instructional stimuli that cause learners to make an attending response, such as shifting one’s body posture, changing the direction of a gaze, scanning the visual field, or holding a fixed stare (Solso, 1988). From this research, we can identify four appeals that can be used to make instructional content more attractive to learners. They are (1) psychophysical appeal, (2) emotional appeal, (3) discrepancy appeal, and (4) commanding stimuli appeal.

**Psychophysical Appeal.** A **psychophysical appeal** is any variation in the color, size, intensity, or pitch of stimuli in your learners’ visual field that causes them to make an attending response. The most accessible and efficient stimuli for you to vary are those coming from your own body: your voice, gestures, posture, movement, facial expressions. You can most efficiently focus your learners’ attention by changing your voice inflection, moving as you talk, and varying your posture or gestures.
**Emotional Appeal.** Just as we have emotional responses associated with our names, learners have emotional responses to certain sights, sounds, words, and smells. The skillful teacher uses the emotional appeal of these stimuli to focus learners’ attention by calling on them by name, commenting from time to time on a unique article of their clothing, using words in the student’s second or native language, and introducing certain sights, sounds, and smells that may relate to the topic of a lesson.

**Discrepancy Appeal.** Our attention is often drawn to stimuli that make a discrepancy appeal by means of the element of surprise—something novel or unique grabs our attention. The history teacher who dresses up in an authentic costume to illustrate a period in history, the science teacher who creates an unusual noise or smell at the start of an experiment, the math teacher who begins by presenting an unsolvable problem, the language teacher who deliberately misspells a word to be used in the day’s lesson, or the speech teacher who stages a shouting match with a student before a lesson on listening skills to demonstrate inattention—all are using the property of discrepancy to focus the attention of learners.

**Commanding Stimuli Appeal.** Teachers often use a commanding stimuli appeal to get learners to comply with a request. Statements such as “Now listen closely” or “All books and pens away,” when delivered assertively, are likely to be followed. Some teachers have their students vote on a code word during the first week of school, which when spoken assertively by the teacher gets everyone to stop what they are doing and look at the teacher.

Holding Attention. The expert practice of structuring involves not only focusing the attention of learners but also giving them something to focus on. This is accomplished by building a learning set. Hunter (1982) refers to this phase of the lesson as the anticipatory set. Its purpose is to make the goal or objective of the lesson relevant to the learners, to put the lesson into a context the learners can relate to, and to get their minds off other distracting stimuli. During this time learners recall past learning by drawing a picture, by summarizing
something they saw or heard, by reading a short passage, or by writing down an idea—all with the intent of relating past with present learning.

Anticipatory sets often take the form of *advance organizers* (Ausubel, 1968). Recall from Chapter 5 that an advance organizer gives learners an overview of what is to come that helps them store, label, and package the content for retention and later use. For example, “Listen to this story and think of the three things the duckling did.”

The Expert Practice of Modeling

Once your learners’ attention is on you, you have the opportunity to model what your students are about to learn. **Modeling** is a teaching activity that involves demonstrating to learners what you want them to do (in the form of action sequences), say (in the form of facts and concepts), or think (in the form of problem solving or learning-to-learn strategies).

When used correctly, modeling can help learners acquire a variety of intellectual and social skills more easily and efficiently than can verbal explanations alone. Modeling is particularly effective for younger learners, who may not be able to follow complex verbal explanations, and who may need to see how something is done before they can actually do it.

Bandura and his colleagues have studied how and why we learn from models (Bandura, 1969, 1977b; Rosenthal & Zimmerman, 1978; Zimmerman, 1989). Recall from Chapter 3 that their research on modeling is referred to as **social learning theory**, which attempts to explain how people learn from observing others. From their work we know that children can learn not only attitudes, values, and standards of behavior from observing adults and peers but also intellectual skills.

Some of this learning takes place by directly imitating what a model (for example, a teacher) is doing, while other learning takes place by inferring why the model is acting a certain way or what type of person the model is. For example, learners acquire certain values about the importance of learning, caring for others, doing work neatly, or respecting other cultures by observing how their parents, friends, and teachers actually behave in the real
world and then inferring from their observations how they too should behave. Although teachers model all the time, we know that some forms of modeling are better than others. Zimmerman and Kleefeld (1977) found that teachers who were taught the practice of modeling were far more effective at helping young children to learn than those who were not.

How One Learns From Models. Four psychological processes need to occur for students to learn from modeling:

1. Attention
2. Retention
3. Production

Figure 10.4 shows how these processes work in sequence when students learn from models. Let’s take a closer look at them to discover how students learn from what they see.

Attention. Demonstrations are of value only if learners are looking at and/or listening to them. In other words, without attention there can be no imitation or observational learning. In the previous section we highlighted the importance of gaining a learner’s attention. Modeling requires not only that you gain your learners’ attention, but that you retain it throughout the lesson. Bandura (1977b) found that teachers hold their learners’ attention better under these conditions:

- The model is someone who has expert and referent power (as discussed in Chapter 8).
- The model is demonstrating something that has functional value to the learner; learners pay little attention to those things for which they see no immediate relevance.
The demonstration is simplified by subdivision into component parts, and it is presented in a clearly discernible step-by-step fashion.

**Retention.** Teachers model because they want their learners to be able to repeat the same actions when they are no longer present. For example, teachers typically model when they demonstrate how to add a column of numbers, sound out a word, or evaluate a short essay. But the transfer of these actions to the learner will occur only if the learner remembers what she saw or heard. Demonstrations from which imitation is to occur must be planned with the goal of retention in mind.

Learners are more likely to remember demonstrations that:

- are linked to previous skills or ideas they have already learned. The more meaningful the demonstration, the more likely it is to be retained. (“Remember how yesterday we added one-digit numbers in a column? Well, today we will use the same procedure on numbers that have two or more digits.”)
- include concise labels, vivid images, code words, or visual mnemonics that help learners hold new learning in memory. (“Look at how I shape my lips when I pronounce this next word.”)
- are immediately rehearsed. Rehearsals can be overt, as when the teacher asks learners to say or do something immediately following the demonstration, or covert, as when the learner visualizes or mentally creates an image of what was demonstrated. (“Now, everyone read the next passage to themselves, repeating silently the sequence of steps I just demonstrated.”)

**Production.** The third component of the modeling process occurs when learners actually do what the teacher demonstrated. In this stage, the mental images or verbal codes that the learner retained in memory direct the learner’s performance. These images or codes are recalled by the practice situation the teacher creates and by the verbal cues given. Having
been evoked, these images guide the actual performance of what was learned during the demonstration.

Learners are more likely to produce what they saw if:

- production follows closely the retention phase. (“OK, now that you’ve practiced remembering the correct sequence of steps I demonstrated, let’s use them to interpret the meaning of the following passage.”)

- the practice situation contains cues or stimuli that evoke the retained mental images or verbal codes. (“This next word requires you to position your lips exactly as you saw me do in the last example.”)

- the performance immediately follows mental rehearsal. (“Let’s switch to several new examples that you haven’t seen before.”)

The production phase allows the teacher to observe the learner and give feedback on how well he or she has mastered the behavior. Giving learners information about the correctness of their actions—without expressing negativity or dissatisfaction—has been shown to increase the likelihood of a correct performance (Vasta, 1976).

**Motivation.** The final stage of learning through modeling occurs when learners experience desirable outcomes following their performance. Desirable outcomes usually take the form of teacher praise, which motivates learners to later repeat what they have just seen. Learners are less likely to repeat the actions of a model if they have experienced punishing or unsatisfying consequences following their initial attempts to imitate the model.

Learners are more likely to repeat the actions of a model immediately and also to transfer it to new situations over time if the teacher:

- gives praise and encouragement rather than criticism immediately after the performance. (“Your answer is partly correct; think some more about what we’ve just discussed” as opposed to “Your answer is wrong. You’re not listening again.”)
d directs the praise at specific aspects of the performance. (“I like how you left enough space between your words” as opposed to “That’s neat writing.”)

d gives directions rather than corrections after an incorrect performance. (“Remember, the first step is to generate a hypothesis” as opposed to “You don’t state the research design before you generate a hypothesis!”)

The last two stages of the modeling process (production and motivation) are typically incorporated into the expert practice of coaching. They are included here as a reminder that your learners will acquire and use new intellectual skills learned through modeling only if such skills are practiced and reinforced.

Guidelines For Effective Demonstrations. Now that we have pointed out the important psychological processes responsible for learning through imitation and observation, we will highlight the teaching skills necessary to use social learning theory to present effective demonstrations. At some point you probably encountered a teacher who was particularly effective at demonstrating what he or she wanted you to learn. You have also had teachers whose demonstrations left you confused. What did the former do to instill the confidence and skills needed to perform the behavior that the latter did not? The answer lies with what makes a good demonstration.

Research on what makes a good demonstration indicates that an expert modeler is a skilled explainer (Good & Brophy, 1991). The accompanying box, Conducting Effective Demonstrations, give specific guidelines for demonstrations, and Figure 10.5 summarizes these guidelines.

The Expert Practice of Coaching

Coaching is that stage of the instructional process during which the learner converts memories into actions as a result of the modeling process. This is the aspect of instruction we
usually think of as teaching. Coaching is the most physically and mentally demanding of the four teaching activities and typically takes up the most time in a lesson.

Effective coaching requires:
- establishing accountability
- providing opportunities for practice
- guiding practice by prompting and questioning
- motivating.

Figure 10.6 summarizes these steps; here we will describe them in detail.

Establishing Accountability. The following extract from a student teacher’s diary describes a common teaching problem:

School seems to mean so little for many of my kids. They can do the work but they just sit there and wait to be reminded or threatened. Take Bart. He comes into class, looks at me when I’m giving the class assignment, but then sits and does nothing until I remind him to get to work. He works for a while and then stops until the next reminder. What work he does is about 25 percent correct. During discussions he never listens to what anyone else is saying. I have about five or six Barts in every one of my eighth-grade classes. (Beth, student teacher)

This excerpt describes what many beginning teachers encounter when it is time for practice or classwork. It is tempting to assume, like Beth, that the problem is motivation: the students just don’t care. Research by Kounin (1970) and Emmer, Evertson, Clements, and Worsham (1994), however, point us in another direction. They suggest that incomplete, sloppy, or missed assignments and an “I don’t care” attitude may reflect the teacher’s failure to make learners feel accountable during the coaching stage of the lesson.

Accountability is the degree to which teachers communicate to learners the classwork they are expected to complete during a specific period of time. The more learners are told what
they are responsible for, the greater the accountability for learning. From research by Emmer et al. (1994), we learn that there are three aspects to accountability: (1) communication, (2) monitoring, and (3) feedback. The accompanying box, *Establishing Accountability*, details the steps you can take.

Toward the end of Beth’s student teaching she became much more skilled at establishing accountability. Here is an excerpt from her cooperating teacher’s evaluation of her performance during her last week of student teaching:

Beth, like many new teachers, tended to hide immediately after giving an assignment. She would sit at her desk and avoid even looking at students. She hoped that the students would begin work immediately and everyone would know exactly what to do. She hadn’t developed the skill of anticipating problems and giving clear step-by-step directions. No sooner would she sit down than students would swarm to her desk with questions about what they were expected to do.

As time passed, she learned to move about the room during the work activity, question learners who were having problems, and encourage those who were doing well. Now, even when the class is working quietly, she continues to move about the room encouraging, praising, and prompting.

Providing Opportunities For Practice. The purpose of practice is to engage learners actively in the learning process. During structuring and modeling, students listen, observe, covertly rehearse, or make brief responses to your questions as you check for understanding. But they have not yet had the opportunity to practice and master the skills you modeled, the information you conveyed, or the problem-solving techniques you demonstrated. During the coaching phase of instruction, learners begin to practice the objectives of your lesson.

Practice has historically been associated with drill (Ornstein, 1992) and direct instructional methods (Borich, 1996). It has been strongly emphasized in behavioristic approaches to

However, practice is essential for accomplishing the goals of any instructional method—direct, indirect, or self-directed. Depending on the instructional method used and the desired objective, practice can take many forms. During direct instruction, practice may take the form of repeating multiplication tables or letters of the alphabet. It may also involve independent seatwork and the use of workbooks. Practice during indirect instruction may occur when the teacher places learners in small groups to solve science or math problems cooperatively. It may also occur when students complete problem-solving handouts and worksheets. During self-directed learning, practice may take the form of reciprocal teaching within the naturally occurring dialogue of the classroom, as we saw in Chapter 6. It may also involve completing extended projects and investigations at a learning center, at home, or in the library.

Regardless of the type of practice activity used, there are several guidelines for promoting effective practice:

1. **Students should understand the reasons for practice.** Practice often turns into busywork, which can create boredom, frustration, and noncompliance. Learners should approach classroom practice with the enthusiasm experienced by an athlete in training. This is more likely to occur if (1) the purpose of the practice has been made known to learners (“We will need to be proficient at solving these problems in order to go on to our next activity”) and (2) practice occurs during as well as after new learning (“Let’s stop right here, so you can try some of these problems yourselves”).

2. **Effective practice is delivered in a manner that is brief, nonevaluative, and supportive.** Eliciting practice involves more than simply saying “OK. Take out your books, turn to page 78, and answer questions 1, 3, 7, and 9. You have 20 minutes.” Rather, your introduction to a practice activity should accomplish three objectives: (1) inform the learners
that they are going to practice something they are capable of succeeding at (“You’ve done part of this before, so this shouldn’t be much different”), (2) dispel anxiety about doing the task through the use of nonevaluative and nonthreatening language (“You’ve got part of it right, Anita; now, think some more and you’ll have it”), and (3) let the learners know that you will be around to monitor their work and support their efforts (“I will be around to help, so let me know if you have a problem”).

- **Practice should be designed to ensure success.** Practice makes perfect only when it is done correctly. If your learners are making many math, punctuation, or problem-solving mistakes, practice is making imperfect. Design your practice to produce as few errors as possible. For example, worksheets should be developed to ensure that at least 80 to 90 percent of the problems are completed correctly.

- **Practice should be arranged to allow students to receive feedback.** As we learned earlier in our discussion of modeling, feedback exerts a powerful effect on learning. Develop procedures and routines for rapid checking of work so that learners know as soon as possible how well they are performing. Having peers correct one another’s practice is an efficient way to give feedback. Also, having answer sheets handy so that learners can check their own work can be a simple and effective means of providing feedback.

- **Practice should have the qualities of progress, challenge, and variety.** Kounin (1970) found that the key to preventing learners from becoming bored was to design practice opportunities that allow them to see that they are making progress (“Don’t forget to check your answers with the key on the board”). In addition, practice should be introduced in a challenging and enthusiastic manner (“This will really test your understanding with some new and interesting kinds of problems”). Finally, practice exercises should include a variety of examples and situations.

Guiding Practice by Prompting and Questioning. We typically think of practice as a solitary activity during which learners master skills that have been explained or demonstrated by the
teacher. This type of practice is often referred to as independent practice. However, other forms of practice involve the active participation of both teacher and learners, whether one-to-one or in groups. This type of practice is called guided practice.

During guided practice, the teacher provides activities that encourage learners to organize a first, crude response to information that has been modeled or demonstrated. Teachers typically stimulate this type of practice with the use of prompts and questions.

**Prompts.** Learners will not always follow your directions to initiate a particular response or demonstrate a particular skill. This is particularly so with younger learners who are practicing unfamiliar action sequences such as tying a shoelace, booting a disk into a computer, writing the letters of the alphabet, using scissors to cut out a picture, or solving a long division problem. At various times during practice, learners need additional support from the teacher to produce the kinds of physical or intellectual skills for which practice was designed. **Prompts** are supplementary aids that teachers use to increase the likelihood that learners will engage in successful practice.

Prompts typically take the form of verbal directions (“Remember what you’re supposed to do first?”), gestures (the teacher points to the lever that engages the disk drive), or physical guidance (the teacher holds the child’s hand and guides it gently as the child forms the letter H). Teachers who are skilled at prompting are careful to provide only the minimum amount of assistance necessary to make the action happen. This is called least-to-most prompting (Cooper, 1979). Prompts must gradually be diminished so that the learner can perform the task independently.

**Questions.** We opened this chapter with Ms. Freeman’s middle-school science class. Let’s return there now to observe the coaching phase of her lesson.

Ms. Freeman: How do plants get their energy from the soil? Are there little Snickers Bars in the dirt and do the plants reach out and chew them?
Terry: It’s like minerals and nutrients.
Ms. Freeman: But are they food? Do they contain energy?
Heather: Well, we throw scraps of food away in the soil like banana peels and apple cores, and they contain minerals the plants eat.
Ms. Freeman: How do the banana peels and apple cores that contain the minerals get into the plant?
Terry: The plant sucks them in through its roots.
Ms. Freeman: But how? Does water that comes through the roots carry the minerals? What do you say, Carla?
Carla: Yes, that’s it. Plants need water to grow, so water must help them get the food they need. But then, wouldn’t water be a kind of food?
Ms. Freeman: Think about this: Do plants make their own food, or are they given food by the water they receive?

Notice how Ms. Freeman guides her learners as they practice thinking through a problem and how she uses questions to heighten interest and stimulate thinking. To Ms. Freeman, questions are not simply a tool for cross-examining students or catching those who are inattentive. Rather, they are the principal mechanism by which she steers her learners to take maximum advantage of their opportunities to practice. The accompanying box, *Asking Questions during Guided Practice*, provides detailed guidelines for using questions during this phase.

**Interactive and Technology-driven Methods of Practice.** Practice, whether independent or guided, can also be provided by programmed instruction, peer and cross-age tutoring, computer-assisted instruction, interactive videodisc, and telecommunications networks. These interactive methods and techniques usually have in common the following features:

- They allow rapid movement within and across content, depending on the learners’ success.
- They allow students to proceed at their own pace and level of difficulty.
They provide immediate feedback about the accuracy of responses.

They gradually shift the responsibility for learning from teacher to student.

Students tend to learn better when they solve real-life problems. As a result, many schools are reorganizing curricula to support independent judgment, critical thinking, and real-world problem solving (Boyer, 1993). Instead of practicing on hypothetical problems, students increasingly are using tutorial methods and communication technologies to address many of the same issues and problems as do professionals. Thanks to advances in computer chip design and fiberoptic technologies, the power of information technology is rapidly being integrated into the school curriculum.

For example, advances in digitalization have made it possible to combine text, sound, and video to create multimedia environments for the personal computer that establish authentic practice environments. Information superhighways allow high-speed transfer of text, voice, and video across schools, geographical regions, and countries to provide real problem-solving contexts. These information highways allow students the opportunity to:

- **search far beyond their local libraries.** For example, students can browse through holdings on “early flight” in the Library of Congress, visually take a tour of a space station circling in space, or ask questions of a curator at the Air and Space Museum via electronic mail.

- **become more specialized and focused on current issues.** For example, students can query a database being compiled by the *New York Times* on a fast-breaking story, scan a recent index of *Scientific American* for the latest advances on gene splicing, or communicate via electronic mail with a researcher stationed in Antarctica.

- **cooperate with other learners at a distance.** Learners may team up with students in another school, state, or nation to share information of mutual interest, such as acid rain, deforestation, or the global economy.
work with mentors outside their own school. Learners can explore connections between academic work and job opportunities or see how principles and concepts are used at more advanced levels, such as in subsequent courses, in the workplace, or in different community contexts.

These methods and technologies provide possibilities for creating authentic practice experiences that only a decade ago were unimaginable. Increasingly, they are being used to encourage independent judgment, critical thinking, and real-world problem solving by allowing the learner to question and prompt human and textual resources that before were accessible only to professionals working in the field. They also reduce a school’s dependence on quickly dated texts and workbooks, which may not provide the learner with sufficient practice opportunities for gradually shifting the responsibility for learning from teacher to student. The accompanying box, Providing Practice Opportunities with Technology, describes some ways that learners can practice during the structuring, modeling, and coaching phases of instruction.

Motivating Learners. Successful groups of learners, no less than successful teams of athletes, demand that their coaches be skilled motivators. The expert practice of coaching, therefore, requires that teachers be skilled at motivating learners. The learning that is elicited and strengthened during guided practice must be maintained, generalized, and transferred outside of practice. Your knowledge of motivation acquired in Chapter 7 and your ability to instill it in your learners will help this take place.

The Expert Practice of Fading

Although all four teaching activities include elements of transfer of learning, fading is the event that most directly achieves it. The expert practice of fading, whether used during direct, indirect, or self-directed instruction, involves two steps:
1. The removal of any external supports required to activate learning (for example, prompts and reinforcers).

2. The provision of independent practice that promotes transfer.

Prompt Fading. The teaching of many action sequences, such as testing a hypothesis, forming correct letters in handwriting, tying knots, focusing a microscope, or dissecting a frog, frequently requires prompts to guide correct responses. Likewise, prompts are frequently required to help learners develop oral language proficiency, essay writing, and problem-solving skills. These prompts may be verbal, gestural, or physical.

You can fade verbal prompts by gradually using fewer words or shorter explanations, allowing more time for learner response, or lowering the sound of your voice as the student begins to work more skillfully and independently. We often fade gestural prompts by gradually shortening the length of the gesture from a full arm sweep, for example, to a short pointing response. Physical prompts can be faded by slowly moving your assistance from hand-over-hand, to guiding the wrist, to lightly touching the forearm, to lightly tapping the elbow. Delaying the fading of prompts can lead to prompt dependency. Conversely, removing prompts too soon can create frustration and anxiety in the learner.

Reinforcer Fading. The purpose of reinforcer fading is to gradually transfer the motivation for performing a skill from extrinsic reinforcers (such as food, tokens, stickers, and praise) to intrinsic reinforcers. It is more desirable and natural for learners to read because they enjoy it than because their parents give them a dollar for every book they read. Likewise, we want learners to keep the classroom neat and to play sports or musical instruments for the enjoyment of the activity rather than to obtain a grade. As you will recall, we outlined specific procedures for reinforcer fading in Chapter 4.
Providing Independent Practice That Promotes Transfer. The following first-person account describes one of the most vexing problems in teaching: how to help students demonstrate their learning in new situations and settings.

Yesterday afternoon I had the most frustrating experience. I was walking to the subway after school and I ran into Gabriel, one of my ESL (English as a Second Language) students. We had just spent the last two days drilling the future tense of “going to,” as in “What are you going to do tomorrow?” So I said, “Gabriel, what are you going to do tonight?” And do you know what he said after two days of drill and practice? “I went to finish my homework tonight.” Not “want” ...but “went.” He completely mixed up the past and future tenses. I don’t know how these kids are ever going to learn this stuff. (Author, personal experience)

**Transfer of learning** is the phrase used to describe this problem. Teachers want their students to transfer their learning, or generalize it from the classroom to the world outside the classroom. Of what value is learning how to speak or write grammatically correct English, solve math problems, type with accuracy, read poetry, plan a menu, or use logic if these skills are practiced only in a classroom under the guidance of a teacher?

Transfer of learning is a central concern whether you are engaged in direct, indirect, or self-directed instruction—that is, whether you want learners to acquire facts, rules, and action sequences; concepts, patterns, and abstractions; or learn how to learn. Regardless of which instructional method you choose or what the goal or objective of instruction is, effective instruction should culminate in the learner’s demonstrating her learning in a new or different context.

The purpose of guided practice during coaching is to help learners acquire new intellectual, social, and motor skills. The purpose of independent practice during fading is to help learners transfer those skills to real-world contexts. Achieving this goal requires teachers
to design independent practice with transfer in mind. Independent practice that promotes transfer should:

- emphasize mastery by beginning after learners have mastered the original task that has been modeled for them.
- have real-world similarity by being completed under the same time constraints and with the same distractions that exist in the real world.
- provide variety by giving learners as many different examples and situations as possible on which to practice, using a variety of sources, such as fiction, editorials, poetry, and magazines.
- offer flexibility by changing the conditions, locations, and peers under which practice occurs.
- promote self-direction by asking learners to identify examples where they can use their skills, such as measurement, punctuation, money management, scientific inquiry, and classifying objects, and to monitor their own progress.

In the chapters ahead we will present several means by which you can determine the degree to which you have acquired the expert practices of structuring, modeling, coaching, and fading.

Summing Up

This chapter introduced you to methods of instructional management. Its main points were these:

- The five factors to consider when establishing priorities for what students should learn are: (1) subject matter we can teach; (2) societal concerns; (3) needs, interests, and abilities of students; (4) the educational philosophy of the school and community; and (5) instructional theory and research.
d According to Gagné, learning outcomes can be divided into verbal information, intellectual skills, cognitive strategies, attitudes, and motor skills.

d Gagné’s hierarchy of learning presumes that lower-level outcomes (for example, memorization) are prerequisite to achieving any higher level of learning.

d According to Bloom et al., Krathwohl et al., and Harrow, respectively, learning outcomes can be divided into the cognitive domain, which represents intellectual abilities and skills; the affective domain, which represents attitudes, beliefs, and values; and the psychomotor domain, which represents bodily movement and physical performance.

d The taxonomy of objectives in the cognitive domain includes six levels of objectives: knowledge, comprehension, application, analysis, synthesis, and evaluation.

d Teaching methods are regularly occurring patterns of practice that promote learning and transfer. They include the direct, indirect, and self-directed forms of instruction. Each teaching method may include the specific teaching activities of structuring, modeling, coaching, and fading.

d Structuring is a teaching activity in which the teacher captures the attention of the learners and focuses them on the outcome of the lesson.

d Modeling is a teaching activity that involves demonstrating to learners what you want them to do (in the form of action sequences), say (in the form of facts and concepts), or think (in the form of problem-solving or learning-to-learn strategies).

d The four psychological processes that need to occur if students are to learn from modeling are (1) attention, (2) retention, (3) production, and (4) motivation.

d Coaching is a teaching activity during which the learner converts images or memories into actions. Coaching involves establishing accountability, providing opportunities for practice, guiding practice by prompting and questioning, and motivating.

d A solitary activity in which the learner masters the skills that have been explained or demonstrated is referred to as independent practice. An activity that involves the active
participation of both teacher and learner, together or in groups, is referred to as guided practice.

d Fading is a teaching activity that gradually diminishes prompts and external reinforcers to activate learning and promote transfer.

For Discussion and Practice

1. In your own words, describe the purpose of goals and objectives.

2. Prepare three goals for the subject or grade you will teach that exhibit a relationship between subject matter mastery, societal concerns, and students’ needs and interests. Justify the responsiveness of each goal to all three considerations.

3. What are Gagné’s five types of learner outcomes? Give an example of each for the subjects you will be teaching.

4. What would be your answer to the student question “Why do I have to learn this stuff?”

5. What is the order or sequence of intellectual skills implied by Gagné’s hierarchy of learning? Explain why this sequence is important.

6. For a subject you will teach, provide an example of a problem-solving exercise that would require learners to combine facts, concepts, and principles in a real-world context.

7. Identify six levels of the taxonomy of cognitive objectives and at least one mental operation each could require.

8. Prepare an objective in your subject area and grade level for each level of the affective domain.

9. Identify three general instructional methods. In your own words, describe a pattern of teaching skills that you might use with each instructional method.
*10. What were some of the ingredients of Ms. Freeman’s lesson that made it a success? What instructional method or methods was she using?

*11. What are the key events of the teaching process according to Gagné, Briggs, and Wagner?

*12. Which events of instruction proposed by Hunter correspond with the skills of structuring, modeling, coaching, and fading?

*13. Identify and give examples in your content area or grade level of four ways a teacher could vary instruction to increase student attention.

*14. Identify and give examples in your content area or grade level of the four psychological processes that must occur in order for students to learn from modeling.

*15. What are five guidelines for creating an effective demonstration? Describe how each would be implemented for a lesson in your field, using specific examples.

*16. Explain in your own words and with the aid of examples the concepts of (a) prompt fading and (b) reinforcer fading.

*17. Describe an example of independent practice that includes all the characteristics required to promote transfer.

*18. What does the phrase “transfer of learning” mean? Provide an example in your teaching field.

*19. What are five ways independent practice can promote transfer? Provide examples in your teaching field of how you would accomplish each in the classroom.
Suggested Readings


This book reviews the research basis for the effective teaching practices discussed in this chapter and provides methods for implementing them in the classroom.

Kennedy, M. C. (Ed.). (1991). Teaching academic subjects to diverse learners. New York: Teachers College Press. This book contains chapters by subject area specialists in the areas of science and mathematics. The various authors discuss effective teaching methods specific to these disciplines. They also address the challenges that classes of diverse learners present to teachers.


1Adapted from Anderson, 1991.

**Instructional management.** Two broad components of teaching skill: (1) expertise in planning for instruction and (2) expertise in delivering instruction.

**Goals.** Educational priorities that focus on the subject matter, societal concerns, and/or learner interests and are used to guide the formation of objectives.

**Objectives.** Statements that specify the skills learners acquire in order to achieve important goals.
How can I use goals to motivate and energize my learners?

Applying Your Knowledge:

Writing Instructional Goals

The following are examples of clear instructional goals for a variety of content areas and levels.

Social Studies

1st-grade unit on “People Who Made America”
Goal: Learners will appreciate that people are different and why that’s good.

3rd-grade unit on “Our Community”
Goal: Learners will understand what makes up a community, what holds a community together, and why communities are important to their lives.

7th-grade unit on “Local History”
Goal: Learners will understand the advantages and disadvantages of placing regional interests over national ones.

11th-grade unit on “U.S. History Since 1965”
Goal: Learners will be prepared to live with the uncertainty that not all problems have solutions.

Science

1st-grade unit on “The World Around Us”
Goal: Learners will realize there are logical answers to questions such as “Mommy, why is the sky blue?”

4th-grade unit on “Living Things”
Goal: Learners will understand the relationships between how an organism looks, the structure of the organism, and the ways in which it functions, so they can see how life is sustained.

11th-grade unit on “Coping with Innovation and Change”
Goal: Learners will be able to recognize and learn ways of dealing with the rapid pace of technology in our everyday lives.

Mathematics

1st-grade unit on “Addition Facts”
Goal: Learners will understand that mathematics derives from the things we see around us.

4th-grade unit on “Percentages”
Goal: Learners will be able to apply mathematics to solving problems regarding daily nutritional needs.

7th-grade unit on “Measurement”
Goal: Learners will appreciate how measurement allows the planning and construction of spaces that are comfortable to live in.

10th-grade unit on “Geometric Propositions”
Goal: Learners will acquire the ability to construct a convincing argument.

Figure 10.1
Tyler’s considerations in goal selection.

Goals help teachers realize a purpose for their teaching and help learners see a reason for exerting a genuine effort to achieve. Without a clear understanding of why a skill is being taught, instruction can become directionless and purposeless.
Table 10.1

Content Outline from a Middle-School Science Text

Unit 5: Landscapes

I. Chapter 9: The Earth’s Changing Surface
   A. Weathering
      1. Comparing rocks and solids
      2. Comparing liquids and solids
   B. Physical weathering
      1. Comparing weathering rates
      2. Static versus dynamic rates

II. Chapter 10: The Restless Crust
   A. Volcanic activity
      1. Lava viscosity
      2. Volcanic cones and topographic maps
   B. Stress, structure, and earthquakes
      1. Folded structures
         a. Relationship between synclines and anticlines
         b. Other types of folded structures
      2. Faults
         a. Recognizing geologic faults
         b. Measuring their movement

III. Chapter 11: Plate Tectonics
   A. Interior of the earth
      1. Relationship between present continents and Pangaea
      2. Changes over time
B. Theory of continental drift
C. Sea floor spreading theory
D. Plate tectonics theory

Table 10.2

Gagné's Classification of Learning Outcomes

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Verbal information</td>
<td>When you require your learners to memorize the alphabet, months of the year, important dates, etc., you are specifying verbal information as an outcome of your instruction. Verbal information also includes expressing this knowledge in the form of labels, words, ideas, or statements. Facts are examples of verbal information. Verbal information provides many of the building blocks for the development of concepts, rules, and generalizations.</td>
</tr>
<tr>
<td>Intellectual skills</td>
<td>Intellectual skills incorporate the learning of discriminations, concepts, simple rules, and generalizations (which are complex rules). Discriminations involve teaching learners to distinguish the sight and sound of “b” from “d,” the color red from green, igneous from sedimentary rock, palmate from pinnate venation, etc. A discrimination, in most cases, is a building block for the formation of concepts. For example, before you can form the concept of types of rocks, or textures, or sounds, you must first be able to see, touch, and hear the differences.</td>
</tr>
<tr>
<td>Cognitive strategies</td>
<td>We discussed cognitive strategies in Chapter 5. As you will recall, this type of learning involves the learning of a sequence of steps to solve a problem, comprehend a reading passage, or write an essay. It also requires the prior learning of concepts and rules as the basis of problem solving.</td>
</tr>
<tr>
<td>Attitudes</td>
<td>If you want your learners to develop preferences for certain things, appreciations for particular ideas, work habits, ways of getting along with others, etc., you are interested in attitudes as an outcome of learning.</td>
</tr>
<tr>
<td>Motor skills</td>
<td>Motor skills are precise, accurate movements of small or large muscles. They are often grouped into action sequences: learning to tie shoes, ride a bike, copy letters, cut out a circle, bisect an angle, dissect a frog, focus a microscope, finger a guitar, or stitch shut a wound. While each of these actions may involve the prior learning of</td>
</tr>
</tbody>
</table>
information, intellectual skills, and attitudes, they typically require the prerequisite learning of more simple actions.

**Figure 10.2**

Gagné's hierarchy of learning.

**Table 10.3**

**Behavioral Outcomes for Each Level of Gagné's Hierarchy**

<table>
<thead>
<tr>
<th>Level</th>
<th>Behavioral Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>Problem solving</td>
<td>Predict which areas of the earth would experience significant rearrangements if there were rapid heating of the earth’s core.</td>
</tr>
<tr>
<td>Principles</td>
<td>Below are listed the generalizations needed to solve this problem:</td>
</tr>
<tr>
<td></td>
<td>1. Most geologic activity occurs where tectonic plates converge.</td>
</tr>
<tr>
<td></td>
<td>2. The convergence of tectonic plates creates weakness in the earth’s crust.</td>
</tr>
<tr>
<td></td>
<td>3. Heating at the earth’s core creates upward pressure on the earth’s crust.</td>
</tr>
<tr>
<td>Concepts</td>
<td>In order to understand and apply these generalizations to solving the problem, some of the concepts that must be learned are:</td>
</tr>
<tr>
<td></td>
<td>earth’s crust earth’s core</td>
</tr>
<tr>
<td></td>
<td>tectonic plates convergence</td>
</tr>
<tr>
<td></td>
<td>pressure geologic activity</td>
</tr>
<tr>
<td>Memorization</td>
<td>In order to acquire these concepts, students must have information (definitions, names, places, etc.) or experiences that allow them to find similarities and differences between the facts, presented in a way that enhances information storage and retrieval.</td>
</tr>
</tbody>
</table>
Applying Your Knowledge:

Matching Instructional Approaches to Learning Outcomes

Teaching Facts, Rules, or Action

Sequences:
1. Teach the whole group using a lecture format.
2. Ask frequent questions and give feedback.
3. Encourage independent learner practice, review, and rehearsal.
4. Organize information into meaningful chunks, and point out relationships between the facts.

Teaching Concepts and Generalizations:
1. Organize the information in advance to provide a meaningful framework for learners.
2. Use cycles of inductive and deductive methods.
3. Provide both examples of the concept and nonexamples.
4. Ask discovery (inquiry) types of questions.
5. Encourage student ideas and contributions.
6. Provide opportunities for students to apply newly learned concepts.
7. Ask students to evaluate how well they have acquired the concepts and generalizations.

Teaching Problem Solving:
1. Provide opportunities for students to explain, predict, compare, analyze, generalize, test hypotheses, and evaluate.
2. Ask difficult questions that encourage reflection.
3. Use small groups to teach the most difficult skills.
4. Encourage student-to-student discussion.
5. Model how you solve a problem by thinking out loud to your learners.
6. Provide plenty of opportunities to practice solving problems.
7. Make learners aware of their own thinking.
How can I write objectives at higher levels of behavioral complexity, such as analysis, synthesis, and decision making?

Table 10.4

Levels of the Affective and Psychomotor Domains

Affective Domain

<table>
<thead>
<tr>
<th>Level</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Receive</td>
<td>The learner is <em>aware of</em> or passively attends to certain phenomena and stimuli (i.e., listening, being attentive to).</td>
</tr>
<tr>
<td>Respond</td>
<td>The learner <em>complies with</em> given expectations by attending or reacting to certain stimuli or phenomena (i.e., obeys or participates as expected).</td>
</tr>
<tr>
<td>Value</td>
<td>The learner <em>displays behavior consistent with a single belief or attitude</em> in situations where he is not forced to comply or obey (i.e., demonstrates a definite preference, displays a high degree of certainty and conviction).</td>
</tr>
<tr>
<td>Organization</td>
<td>The learner <em>is committed to a set of values</em> and displays or communicates his or her beliefs or values (i.e., develops a rationale for a set of values, makes judgments about sets of values).</td>
</tr>
<tr>
<td>Characterization</td>
<td>The total <em>behavior of the learner is consistent</em> with the values he or she has internalized (i.e., develops a consistent philosophy of life, exhibits respect for the property of others, demonstrates an aversion to drugs, shows a commitment to school).</td>
</tr>
</tbody>
</table>

Psychomotor Domain

<table>
<thead>
<tr>
<th>Level</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Imitation</td>
<td>When the learner is exposed to an observable action he begins to make covert imitation of that action. This is then followed by overt performance of an act and the capacity to repeat it. The performance, however, <em>lacks neuromuscular coordination</em> or control and hence is generally in a crude and imperfect form (i.e., impulse, overt repetition).</td>
</tr>
</tbody>
</table>
Manipulation Emphasizes the development of *skill in following directions*, performing of selected actions, and fixation of performance through necessary practice. At this level the learner is capable of performing an act according to instruction rather than just on the basis of observation, as is the case at the level of imitation (i.e., following directions).

Precision The proficiency of performance reaches a higher level of refinement in reproducing a given act. The learner performs the skill *independently of a model or a set of directions*. Accuracy, proportion, and exactness in performance become significant (i.e., reproduction, control, errors reduced to a minimum).

Articulation Emphasizes the *coordination* of a series of acts by establishing appropriate sequence and accomplishing harmony or internal consistency among different acts (i.e., performance involves *accuracy and control* plus elements of speed and time).

Naturalization A high level of proficiency in the skill or performance of a single act is required. The behavior is performed with the least expenditure of psychic energy. The act is routinized to such an extent that it results in an *automatic and spontaneous* response (i.e., performance becomes *natural and smooth*).


Table 10.5

<table>
<thead>
<tr>
<th>Three Instructional Methods and Some Related Teaching Skills</th>
</tr>
</thead>
<tbody>
<tr>
<td>Instructional Method</td>
</tr>
<tr>
<td>Teaching</td>
</tr>
<tr>
<td>Skills</td>
</tr>
<tr>
<td>Structuring</td>
</tr>
<tr>
<td>Method</td>
</tr>
<tr>
<td>-------------</td>
</tr>
<tr>
<td>Modeling</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Coaching</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Fading</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>
**Direct instruction.** Instructional methods that present information explicitly through lecturing, questioning, and demonstration. Direct instruction is particularly suited to the acquisition of facts, rules, and action sequences.

**Indirect instruction.** Instructional methods best suited for the learning of concepts, patterns, and abstractions. Indirect instruction involves the expression of learner ideas, teacher-mediated discussion, and group problem solving.

**Figure 10.3**
Specific teacher behaviors for structuring, modeling, coaching, and fading.

**Self-directed instruction.** An instructional method that places much of the responsibility for learning on the learner by using metacognition, subvocal rehearsal, guided practice, and self-evaluation.

**Instructional events.** Elements of the teaching process that allow learners to acquire and transfer new information and skills.

---

**Table 10.6**

<table>
<thead>
<tr>
<th>Gagné, Briggs, &amp; Wagner</th>
<th>Borich &amp; Tombari</th>
<th>Hunter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gaining attention</td>
<td>Structuring</td>
<td>Review</td>
</tr>
<tr>
<td>Methods</td>
<td>Terms</td>
<td></td>
</tr>
<tr>
<td>----------------------------------------------</td>
<td>--------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>Informing learner of objective</td>
<td>Anticipatory set</td>
<td></td>
</tr>
<tr>
<td>Stimulating recall</td>
<td>Objectives and purpose</td>
<td></td>
</tr>
<tr>
<td>Presenting material</td>
<td>Modeling</td>
<td></td>
</tr>
<tr>
<td>Guiding learning</td>
<td>Checking for understanding</td>
<td></td>
</tr>
<tr>
<td>Eliciting behavior</td>
<td>Coaching</td>
<td></td>
</tr>
<tr>
<td>Providing feedback</td>
<td>Closure</td>
<td></td>
</tr>
<tr>
<td>Enhancing retention</td>
<td>Fading</td>
<td></td>
</tr>
<tr>
<td>Promoting transfer</td>
<td>Independent practice</td>
<td></td>
</tr>
</tbody>
</table>

Focus on

Madeline Hunter, University of California, Los Angeles

I graduated as a clinical psychologist, and my first job was at the Los Angeles Childrens’ Hospital. There, in a case study conference, I gave a “super diagnosis” of a child’s problem. The attending school staff looked at me coldly and said, “So, what do we do tomorrow morning?” That question changed my life—for what good is a diagnosis without a prescription? So I became a school psychologist and found that all teachers had taken an Ed Psych course and learned about salivating dogs and pecking pigeons, none of it taught as a basis for “tomorrow morning” decisions in teaching. Consequently, I began translating psychological research into the language of teaching. Most recently, I have been translating brain research from the language of neurology into the language of teaching (pedagogy), so that teachers can enable students to learn more efficiently and effectively.
Many people do not realize that on the basis of valid theory, the teacher must make professional decisions. Every decision a teacher makes (or delegates to students) falls into one of three categories. The first is content: What is the intended learning? Here, new curriculum work in literacy for understanding and communicating with others, and learning to integrate and generalize math, science, and social studies to current problems, is giving us choices as to what is worth learning. Authentic assessment tells us where to begin and when to proceed.

The second category of professional decisions, learning behaviors, is focused on what a student is doing so that his or her brain generates meaning for the new learning. Although a student may have a preference for a certain learning style, it is the teacher’s responsibility to help the student develop proficiency in many ways of learning rather than being limited to a few. Also, this decision must include student demonstrations that learning has occurred (authentic assessment). From the first two decisions, content and learning behavior, is derived the learning target (objective, outcome), which validates that students have acquired the knowledge, process, skill, or attitude intended and which contribute to a productive, satisfying life.

The third decision, teaching behavior, is based on research-validated cause-and-effect relationships between teaching and learning. These generalizations are grouped under (1) increasing students’ motivation (effort) to learn, (2) accelerating the rate and degree of that learning, (3) enhancing retention, and (4) transfer of that learning, which makes problem solving, creativity, and productive, satisfying decisions possible. Of all the school factors, the teachers’ ability to make and implement valid professional decisions is the most important in students’ achievement.

Teachers constantly ask, “Why didn’t we learn this in our previous teacher education classes?” The answer is that psychology is a relatively new science.
Only in the last two decades has research on the human brain and how it functions been advanced enough to reveal the relationship between the professional decisions of a teacher and the learning success of all students.

**Structuring.** Getting learners ready to learn by selecting, organizing, and previewing the content to be presented.

What are some of the ways to capture student interest at the start of a lesson?

**Psychophysical appeal.** Any variation in the color, size, intensity, or pitch of stimuli in the visual field of learners that results in the learners’ making an attending response.

**Emotional appeal.** A characteristic of an instructional stimulus that draws on the emotional response of learners to focus learner attention.

**Discrepancy appeal.** The use of novel, unique, or surprising stimuli to focus the attention of learners.

**Commanding stimuli appeal.** The use of assertive commands or statements by an instructor to focus learner attention.

**Anticipatory set.** An organized framework usually presented to learners at the beginning of a lesson that helps them relate past with present learning and that places the lesson into a context that the learners can relate to and focus on.
Gaining learners’ attention and holding it is one of the principal ingredients of expert instructional practice. Teachers use a variety of structuring techniques to accomplish this.

**Modeling.** Demonstrating what learners are about to learn; the process of being attentive to, remembering, imitating, and being rewarded for imitating specific behaviors.

How do I teach by modeling?

**Figure 10.4**
How one learns from models.

A significant portion of a teacher’s time is spent modeling skills and giving effective demonstrations. When using modeling or demonstrations, teachers must consider such psychological processes as attention, retention, production, and motivation.

How can I conduct an effective demonstration?

**Coaching.** An aspect of instruction by which the teacher helps learners master particular skills through the skillful use of practice and prompts.

**Figure 10.5**
Guidelines for an effective demonstration.
Applying Your Knowledge:

Conducting Effective Demonstrations

Follow these guidelines for presenting vivid and effective demonstrations.

• **Focus learners’ attention.** Begin your demonstration only when your learners’ attention is focused on you. Then direct the learners’ attention to what you want them to see.

• **Stress the value of the demonstration.** Briefly and concisely point out why the learners should observe what you are about to show them. Then relate new learning to prior learning to show its relationship to content already successfully mastered.

• **Talk in conversational language while demonstrating.** Back up to cover unfamiliar concepts, repeat actions when needed, use analogies to bridge content gaps, and use examples to reinforce what has been learned. Then probe for understanding.

• **Make the steps simple and obvious.** Break complex actions into simple steps that can be followed one at a time. Point out what will be done next, and then describe the action as you perform it, thinking out loud to describe how the action actually is performed.

• **Help learners remember the demonstration.** Go slowly (“Stop me if I’m going too fast”), exaggerate certain actions (“See how puffy my lips are when I pronounce this word”), highlight distinctive features (“Look at the strange coloring of the specimen”), and give simple memory aids to help learners retain what they see (“Notice the height of the lens from the specimen slide”).

**Figure 10.6**

Expert coaching.
How can I help students take responsibility for their own learning?

Applying Your Knowledge:

Establishing Accountability

The following actions will allow you to increase your learners’ accountability.

**Communication.** Inform learners what they are to do and ensure that each learner understands the skills she is expected to perform. Do this by calling on several students of different ability levels to check on the extent to which they understand the class assignment before giving the signal to begin.

**Monitoring.** Circulate around the room to see that work has been started and is being done correctly. Monitoring should occur whether the classroom assignment involves independent seatwork, small group problem solving, or copying from the blackboard.

**Feedback.** Learners feel more accountable for learning when they receive immediate feedback on their performances. Efficient routines for providing feedback may include peer feedback, self-evaluation, or teacher feedback.

What can I do to make my learners look forward to practicing their skills?

Learners need practice. During the coaching phase of instruction, teachers motivate learners to want to practice, give them many opportunities to do so, and guide practice by prompts and questions.

**Independent practice.** The solitary attempt of a learner to master skills.
**Guided practice.** Teacher-provided activities used to encourage learners to organize a response to what has been modeled or demonstrated, often with prompts and questions.

**Prompts.** Supplementary or additional aids that teachers use to increase the likelihood that learners will engage in successful practice.

How can prompts be used to help guide learners to a first response?

Applying Your Knowledge:

**Asking Questions during Guided Practice**

**Plan Your Questions in Advance.** Although talk-show hosts make it appear as if their questions are spontaneous and unrehearsed, this seldom is the case. In reality, ad-libbing and spontaneity can lead to dead time. The type of questions you select, their level of difficulty, and the sequence in which you ask them should be based on your lesson objectives.

**Make Questions Concise, Clear, and to the Point.** Effective oral questions are like effective writing: every word should be necessary. Pose questions in the same natural conversational language you would use with any close friend.

**Allow Time for Students to Think (wait time 1).** Many teachers do not allow learners enough time to answer a question before calling on someone else or moving to the next question. Gage and Berliner (1988) and Rowe (1974) report that, on average, teachers only wait about 1 second for learners to respond. Borich (1996) and Ornstein (1992) recommend that you increase the wait time to 3 or 4 seconds for lower-level questions and to as much as 15 seconds for higher-level questions.
Keep the Students in Suspense. First deliver the question, then mention the student’s name. Similarly, randomly select the students you want to answer your questions. You want your learners to feel that they could be called on at any time.

Give Students Sufficient Time to Complete Their Responses Before Redirecting the Question or Probing (wait time 2). Wait time 2 is the time you wait following a student answer before probing for deeper understanding or redirecting the question when the answer is incomplete or wrong. To maintain lesson momentum, teachers often interrupt a learner before she or he has finished responding.

Provide Immediate Feedback to the Learner. Acknowledge correct answers by providing encouragement, elaborating on the response, further probing, or moving on to another question. Most important, communicate to the learner that you heard and evaluated the answer. Follow up on incorrect or incomplete answers with probes or by redirection of the question to another student.

What are some ways to use questions to encourage learners to respond correctly?

How can technology make independent practice and transfer a practical classroom goal?

Applying Your Knowledge:

Providing Practice Opportunities with Technology

Programmed Instruction. Programmed instruction refers to written instructional materials that students work on by themselves at their own level and at their own pace. Programmed instruction materials typically break skills down into small
subskills like those that might be identified in a learning hierarchy (Figure 10.2.) Questions and prompts along the way actively engage learners in formulating responses. The learner is given immediate knowledge of the correctness of his or her answer, usually directly beneath or near the question or prompt.

Programmed instruction has not been found to be more effective than conventional methods when it is used as the sole source of instruction (Bangert, Kulik, & Kulik, 1983; Slavin, 1984). However, when self-instructional materials cover familiar content and learners work in mixed-ability learning teams (called Team Assisted Individualization; Slavin et al., 1984), programmed materials have been found effective (Good, Grouws, & Egmeier, 1983; Slavin, 1985; Slavin & Karwait, 1984).

**Computer Assisted Instruction (CAI).** Computer assisted instruction provides many of the same practice opportunities of programmed instruction. CAI programs are available at many different grade levels and content areas to give students practice, assess understanding, and provide remediation if needed. The advantage of CAI over written programmed materials is that the accuracy of student responses can be quickly assessed, and the sequence and difficulty of the activities can be changed to correspond with the learners’ current level of functioning. Thus practice can be individualized—more time can be spent on a particular topic or skill, or the program can return to an earlier sequence of instruction to review prerequisite learning.

CAI can provide color pictures, charts, and diagrams that can motivate learners and enhance the authenticity of the practice experience. Most computer assisted instruction is now presented to learners on personal computers in the classroom with software developed by textbook publishers. As with other individualized learning methods, CAI has been found most effective when it provides practice
opportunities for content already presented during the structuring, modeling, and coaching phases of instruction (Atkinson, 1984; Kulik & Kulik, 1984).

**Interactive Videodiscs and CD-ROM.** Interactive videodiscs (laser discs) and CD-ROM share the same advantages over both written and computer assisted programmed material. These new laser technologies can present to the learner any combination of text, diagrams, slides, maps, films, and animations on demand, thereby greatly increasing the flexibility of the recorded content over traditional programmed instruction. They can also hold different soundtracks—for example, one in English and another in Spanish. The learner can freeze frames indefinitely and locate any frame or sequence of frames on the disc almost instantaneously.

Because of these characteristics, interactive videodiscs and CD-ROM technology are particularly suited to simulating and modeling higher-order thinking skills and real-life experiences, such as laboratory experiments, physical motion, and even noises and sounds that can make learning come alive. For this reason, these technologies are quickly becoming the preferred medium for providing interactive individualized practice activities. Since these are new technologies, researchers have just begun to study their effects in the classroom. However, their effectiveness has been documented most frequently in the field of science.

**Fiberoptics/Telecommunications.** This technology offers the greatest opportunity to stimulate the senses through multimedia, making the learning environment more fluid and personalized. Often referred to as the “living curriculum,” the combination of laser technology and telecommunications has many of the features of interactive videodisc technology, with the added advantage that no longer must the subject matter being studied exist on a videodisc inside a personal computer. Access to information along communication
superhighways connects the learner rapidly with human and textual resources across schools and geographical locations.

From teacher input during the structuring, modeling, and coaching phases of instruction, the learner creates his or her own curriculum by selecting information pathways that increasingly bring authentic detail and professional expertise to the problem at hand. In this manner, responsibility for the retention and application of content passes gradually from the teacher to the learner, encouraging cooperative ventures with other students, professionals, and resources.

**Fading.** The removal of external learning supports and the simultaneous provision of independent practice to promote transfer.

**Transfer of learning.** The process whereby skills learned in one situation or under one set of conditions are demonstrated in a different situation or under a different set of conditions.

How can I help my learners transfer what I teach to new situations and settings?

Questions marked with an asterisk are answered in the appendix.