Chapter 6
Making Learners Active Thinkers

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

• How can I help my students learn from their own beliefs and from the social environment in which they live?
• How can I emphasize primary concepts, generalizations, and underlying themes rather than isolated facts?
• How can I help my learners organize what they know in advance to get them ready to learn?
• Should I deliberately plan lessons that create conceptual conflict?
• How can I approach written work as a problem-solving activity?
• How can I make learning a joint cognitive effort between me, the learner, and the class rather than a teacher-controlled search for knowledge?
• How can I model for my learners the thinking strategies they will need to solve real-world problems?
• How can I use group discussion to allow learners to create their own representations and elaborations of the content to be learned?
• How do I plan cooperative learning lessons so that the group goal is achieved while individual group members take responsibility for their own learning?
In this chapter you will also learn the meaning of these terms:

- **advance organizer**
- **authentic problems**
- **categorization**
- **cognitive apprenticeship**
- **conceptual conflict**
- **constructivism**
- **cooperative learning**
- **direct explanation teaching**
- **discovery learning**
- **intentional learners**
- **joint cognitive venture**
- **organization**
- **reciprocal teaching**
- **situated learning**

In Chapter 5 we described what good thinkers do: they have factual and know-how knowledge, and they actively receive new knowledge and build connections to what they already know. We described several models of good thinking that stress the importance of giving learners the opportunity to construct their own knowledge and figure things out for themselves. The object of this chapter is to present you with a wealth of instructional methods for doing this. Let’s begin by looking at two lessons, both designed to teach fractions. Our purpose in examining these two lessons will be to see how well each allows learners to “construct” knowledge and meaning for themselves.

Ed Robbins is teaching a unit on fractions to his fourth-grade class. During the first 12 weeks of the year, all fourth-graders learned about numbers and
number theory. They covered such topics as odd, even, positive, and negative numbers. The fourth-graders are also familiar with such numerical concepts as multiples, factors, and the base 10 system for writing numbers.

On the day we observe Mr. Robbins, he is teaching a lesson about equivalent fractions as different ways of representing the same amount. During four previous lessons, his learners have studied fractions as quantities and learned how fractions that look different (for example, 1/2 and 2/4) actually represent the same amount. The present lesson is intended to reinforce this idea.

Mr. Robbins begins the lesson with a quick review of the previous lesson. On the overhead projector he shows pictures of objects such as pies and loaves of bread divided to represent different fractions of the whole. In rapid-fire fashion his learners call out the fractions. He then projects a chart with undivided whole objects and has learners come up and divide them into halves, thirds, fourths, and so on while other learners do the same on worksheets. Each learner gets immediate feedback on his or her answers.

Next, he signals the class to clear their desks except for a pencil and draws their attention to a large, brightly colored chart hanging from the front blackboard (shown here in Figure 6.1. He passes out a similar dittoed chart to the students. Mr. Robbins explains that for each row the students are to complete the fraction with a denominator of 100 that equals the fraction in the row. Then they are to fill in the third row with the decimal equivalent of that fraction.

Mr. Robbins first models how to do this. He demonstrates (pointing out that they have already learned this) how to make an equivalent fraction by multiplying the original fraction by a fraction that equals 1. He works
several examples to be sure that his students understand the concept and can copy the examples onto their charts.

He then calls on a number of students to come to the front of the room and demonstrate several more examples for the class. Mr. Robbins asks the students to describe what they are doing as they solve the problems. He checks that the rest of the class correctly fills in the charts at their desks.

Finally, he breaks the class into small groups and directs them to fill out the remainder of the chart. He provides each group with a key to immediately check their responses when finished. As the learners engage in their seatwork, Mr. Robbins moves from group to group, checking, giving feedback, and correcting or praising as needed.

Mr. Robbins has designed this lesson to show that fractions that look different can be equal in order to point out the relationship between decimals and fractions, and to use this as a foundation for teaching the relationships between dollars, decimals, and fractions in a subsequent lesson. In the classroom next door, Kay Greer is also teaching a unit on fractional equivalents. Let’s look in on her lesson.

As the lesson begins, Mrs. Greer asks Denisha to tell the class what she said yesterday about fractions. “A fraction like 1/2 isn’t a number,” Denisha asserts, “because it isn’t on the number line.” Denisha points to the number line running along the top of the front blackboard. “See! There’s no 1/2. Just 1, 2, 3, 4,...like that!”

“Well, class, let’s think about what Denisha says. Let me give you a problem and we’ll study it and, then, maybe come to some conclusion about whether a fraction is a number.” She turns on the overhead and projects the following for all to see.
A boy has four loaves of bread that he bought at the local supermarket. He has eight friends and he wants each friend to get an equal part of the bread. How much bread should he give each of his friends?

Mrs. Greer draws the four loaves on the overhead and watches as the children, arranged in six groups of five, copy the drawings into their notebooks. She walks around the classroom occasionally prompting groups with the question, “How much bread is each one going to get?”

The children argue among themselves: “You can’t do it!” “There isn’t enough bread!” “How many slices are in each loaf?” After about 10 minutes Mrs. Greer asks, “Does anyone need more time to work on this? How many are ready to discuss?”

A few raise their hands. The rest are busy drawing and redrawing loaves of bread, sketching lines across them. Several minutes go by and Mrs. Greer says, “OK, would someone like to show their solution?”

Frank raises his hand, walks to the overhead and draws his solution. “I’m not sure it’s right,” he hedges. Frank draws four loaves of bread and divides each loaf into eight slices. (Frank’s drawing appears in Figure 6.2.) He looks up and announces to the class, “Each friend gets four slices!”

“That’s wrong!” challenges Rosa. “Each friend gets two slices, see!” She walks to the overhead, draws four loaves of bread and divides each loaf into four slices. (Rosa’s drawing appears in Figure 6.3.)

“Why not just give each friend half a loaf?” asks Albert.

“Come up here and draw your solution,” says Mrs. Greer. Albert walks up to the overhead and sketches his proposal to the class. “Can you write the number that each gets?” asks Mrs. Greer. Albert writes the number “1/2” for all to see.
“Well, Albert’s and Rosa’s slices are bigger than mine,” protests Frank.

“Frank,” asks Mrs. Greer, “why not write the number that shows how much of the bread your eight friends get? Albert’s number is 1/2. How much is one slice as Albert sees it?” she asks the class.

“One eighth,” proposes Cal. “Can you write that?” inquires Mrs. Greer. Cal comes up to the overhead and writes “1/8” next to Frank’s drawing.

As children write different numbers for their solutions, Mrs. Greer asks, “Well, how can we have three different numbers for each of these solutions? We have one half, two fourths, four eighths,” pointing to the different quantities and fractions on the overhead.

After several moments of silence several hands shoot up and one by one the children give explanations for the seeming discrepancy. The lesson continues in this vein until five minutes before the bell. Mrs. Greer reviews what was concluded and sets the goal for the next lesson on fractions.

(Adapted from Ball, 1991)

Now, let’s compare the lessons of Mrs. Greer and Mr. Robbins. Both lessons had the same goal: To help learners understand the concepts of quantity and equivalence pertaining to fractions. But these two teachers have designed two very different lessons to achieve this same end.

You may have noticed that the behavioral science approach has heavily influenced Mr. Robbins’s lesson (recall Chapter 4). His lesson has been designed to elicit a minimum of mistakes. His activities are aimed at the practice of correct responses followed by immediate feedback. For Mr. Robbins, learning involves correct responding, which is best accomplished by means of a teacher-directed or teacher-centered lesson.

Mrs. Greer, on the other hand, has a different view of learning. She is less focused on correct, rapid responses than on thought processes involving reflection,
problem solving, analysis, and inquiry. Her lesson takes into consideration the fact that her learners already have information and beliefs about fractions that may or may not be correct.

Mrs. Greer wants to expose misconceptions and challenge learners to acquire new, more accurate perceptions through their own powers of reasoning. She carefully avoids providing answers. Her objective is to help learners understand fractions by influencing the cognitive processes by which they can elicit correct responses.

Recall that the information processing model of thinking you learned about in the last chapter stresses the importance of reception, availability, and activation in order for meaningful learning to occur. According to this model, any classroom lesson that hopes to produce meaningful learning and make learners good thinkers must ensure attention, acknowledge learners’ prior knowledge, and ensure that learners actively engage that knowledge. In this chapter we will concentrate on activation—or how to teach learners to build internal and external bridges between what they already know and what they are about to learn.

In the previous chapter, we also reviewed the parallel distributed processing (PDP) model of thinking. Recall that this model emphasizes that learners construct their own knowledge, build their own rules and principles, and acquire unique concepts and connections among ideas and facts while thinking. Therefore, lessons aimed at teaching good thinking should allow learners to figure things out on their own. In this chapter you will learn a number of instructional approaches that allow learners the opportunity to figure things out on their own and to “construct” knowledge and meaning for themselves.

The PDP model also stresses that knowledge is acquired from social interactions. According to this model, learning and thinking are not just “in-the-head” activities. Rather, they depend on involvement with peers and adults.
Therefore, the instructional methods covered in this chapter emphasize the importance of learning, thinking, and constructing knowledge in a social context.

**Constructivism: Putting Learners in the Driver’s Seat**

Current cognitive models of learning and thinking (such as the information processing and PDP models) stipulate that the mind learns not by passively recording or absorbing information, but by actively trying to make sense of it. These models tell us that in the process of making sense of information, active learners build internal connections or relationships among the ideas and facts they are learning. In addition, they build external connections between the new information and what they already know. This approach to learning emphasizes the active role of the learner, in contrast to the behavioral science approach, which emphasizes the active role of the teacher. **Constructivism** is a term used by cognitive psychologists to represent this approach to learning.

Over the past decade, the term “constructivism” has come to mean more than a theory about learning. It has become associated with a theory of knowledge that says that the world is inherently complex, that there is no objective reality, and that much of what we know is constructed from our beliefs and the social milieu in which we live. Here is how a leading constructivist, Ernst von Glasersfeld, describes this philosophy of knowing:

From the beginning, in the 5th century B.C., the skeptics have shown that it is logically impossible to establish the “truth” of any particular piece of knowledge. The necessary comparison of the piece of knowledge with the reality it is supposed to represent cannot be made because the only rational access to that reality is through yet another act of knowing.
The skeptics have forever reiterated this argument to the embarrassment of all the philosophers who tried to get around the difficulty. Nevertheless, the skeptics did not question the traditional concept of knowing.

This is where constructivism, following the lead of the American pragmatists and a number of European thinkers at the turn of this century, breaks away from the tradition. It holds that there is something wrong with the old concept of knowledge, and it proposes to change it rather than continue the same hopeless struggle to find a solution to the perennial paradox. The change consists of this: Give up the requirement that knowledge represents an independent world, and admit instead that knowledge represents something that is far more important to us, namely *what we can do in our experiential world, the successful ways of dealing with the objects we call physical and the successful ways of thinking with abstract concepts*. (Glasersfeld, 1995, pp. 6–7)

In addition to being associated with a philosophical theory on the existence of knowledge, the term “constructivism” has also become associated with an educational movement that restores learners to the forefront of the instructional process. The goal of this movement is to redesign educational practice so that lessons are planned and sequenced to encourage learners to use their experiences to actively construct understanding in a way that makes sense to them. The constructivist movement in education has resulted in numerous curriculum reforms in the teaching of reading, writing, mathematics, social studies, and science (Duit, 1995; Saxe, 1995; Spivey, 1995).

In this chapter, we will use *constructivism* to refer to those instructional practices derived from research in cognitive psychology that stimulate learners to activation: practices that help build internal connections and organize information
in working memory so it is more meaningful and understandable, and that build external connections between old and new information. Thus, for our purposes, constructivism is the application to classrooms of learning principles derived from cognitive models that provide learners the opportunity to construct their own ways of knowing.

Constructivist instructional practices, whether in the areas of science, social studies, mathematics, reading, or writing, have the following characteristics in common:

1. They organize learning and instruction around important ideas.
2. They acknowledge the importance of prior learning.
3. They challenge the adequacy of the learner’s prior knowledge.
4. They provide for ambiguity and uncertainty.
5. They teach learners how to learn.
6. They view learning as a joint cognitive venture.
7. They assess a learner’s knowledge acquisition during the lesson.

Let’s examine each of these elements in more detail.

Organize Learning Around Important Ideas

Rene Jordash was unhappy with the way her world history text discussed World War I. In particular, she felt that its discussion of the causes of the war led her tenth-grade students to think that it all started because someone got shot in his carriage. She wanted her students to understand that the causes of major wars have their roots in religious, ethnic, economic, and other conflicts, which fester over long periods of time. So, to help her learners appreciate the complexity of causes underlying conflicts such as
World War I, she started her third-period class with the question: “What would have happened if the Archduke Ferdinand of Austria hadn’t been shot?”

Learners tend to view learning as consisting of memorizing facts, filling out worksheets, answering end-of-chapter questions, and taking tests. Extensive interviews with learners of various ages reveal that, in comparison to adults, school-age learners typically do not see learning as a goal of instruction (Bereiter & Scardamalia, 1989). In other words, they do not attend to a lesson with the explicit intention of learning, but rather with the idea of completing assignments and activities, passing tests, and doing homework.

Cognitive psychologists believe that learners’ view of learning as an activity rather than a goal leads them to be passive during classroom instruction (Bereiter & Scardamalia, 1989). In other words, they sit in classrooms waiting for the spelling worksheet or biology lab sheet to be passed out, homework to be assigned, and test dates to be given. So how does a teacher help learners view learning as a goal rather than an activity? To do this, most cognitive approaches to instruction advocate that teachers focus their lessons on and make explicit to learners the primary concepts, generalizations, and underlying themes of the content they are teaching rather than focus on isolated facts or bits of information (Brooks & Brooks, 1993). Let’s look at some ways teachers can do this.

Curriculum guides and textbooks don’t always identify these larger ideas, generalizations, or principles for you. Often they may, instead, be compilations of facts or activities. For example, a U.S. history text typically has chapters devoted to different wars: the French and Indian War, the American Revolution, wars with Mexico, the Civil War. Students typically learn facts about these wars—names, dates, places—and fill out maps and take tests to assess that learning. A
constructivist approach to teaching about important wars might instead involve students’ learning about the theme of human conflict: its underlying causes and its outcomes. Wars would be presented as a group of events to help learners construct a larger understanding of American history.

In advocating that teachers organize instruction around primary concepts, generalizations, and underlying themes, cognitive psychologists are not denying the importance of factual knowledge; as we saw in the previous chapter, prior knowledge is considered a requirement of good thinking. Rather, they are saying that factual knowledge can be acquired in a variety of ways (for example, from reading, lectures, peers), and that the best way for learners to retain and apply this knowledge is to put it in a larger, more lifelike context that stimulates learners to reflect, organize, analyze, and problem solve.

The importance of focusing lessons around important ideas as opposed to facts has resulted in numerous curriculum reforms during the past decade. Science curricula are being developed that organize information around “conceptual themes” like cause and effect, change and conservation, diversity and variation, and energy and matter, rather than around topics such as the digestive system, the planets, nutrition, or electricity. Language arts curricula present readings in the context of themes such as fantasy/realism, reflection/impulsivity, reactive/proactive, and freedom/responsibility, rather than in genre-specific units, like poetry, prose, mythology, and nonfiction.

The rationale behind these curricular changes is that learners acquire meaning and understanding by organizing information for themselves, connecting it to other information, and storing it as networks or schemata, rather than by being told isolated bits of information. The more that lessons can be focused on larger units of knowledge—concepts, generalizations, and underlying themes—the more likely learners are to connect the new subject matter with what they already know.
Acknowledge the Importance of Prior Knowledge

Cognitive psychologists believe that learners, even at the earliest grade levels, have some information about nearly every topic they study. This information may be in the form of ideas, however vague; unconnected facts; implicit rules; or images. Frequently, this information consists of mistaken beliefs, such as “the world is flat,” “the sun moves around the earth,” “the cause of the Civil War was the firing on Fort Sumter,” or “all microorganisms are bad.” This prior knowledge affects learners’ attempts to construct meaning out of what they are hearing, seeing, or reading. Unlike the behaviorists, who view the learner as passively absorbing and storing new information, cognitive psychologists assert that learners are continually engaged in trying to make sense out of what they learn.

At this point you might ask yourself, “Isn’t the emphasis placed on prior knowledge by cognitive psychologists similar to what the behaviorists mean by prerequisite skills?” The answer is that although prior knowledge and prerequisite skills have some similarities, the former term, as cognitive psychologists use it, connotes far more than the latter.

Behaviorists view prior knowledge in terms of readiness for instruction. When prior knowledge is lacking, they see the teacher’s role simply as one of giving it to the learners so that they can acquire new knowledge. Cognitive psychologists, on the other hand, view prior knowledge as a cognitive structure—or schema—which suggests deeper understandings, interconnectedness with other data, and connections to incoming knowledge. The teacher’s concern with prior knowledge is not simply to fill up an empty vessel, as the behaviorists contend, but rather to help learners gain entry to that knowledge, understand its conceptions and misconceptions, and swap inappropriate cognitive structures for better ones (Floden, 1991).
Organizing Prior Knowledge. David Ausubel was one of the first American educational psychologists to advocate the importance of prior knowledge as a cognitive structure or schema for achieving meaningful learning. Ausubel (1960, 1968) held that people learn when they (1) assimilate new material into existing schemata and (2) reconstruct or accommodate new material to existing schemata by transforming it in idiosyncratic ways. He championed the concept of an “advance organizer” to provide learners with instructional supports to facilitate meaningful learning.

An advance organizer is a summary of the concepts, generalizations, and themes to be learned, presented at a general and inclusive level. When presented to learners at the beginning of a lesson, it can help learners both recall familiar material (material the learners had prior knowledge of) and learn unfamiliar material. (For example, the questions and classroom examples that begin each chapter of this book are advance organizers.) Ausubel believed that advance organizers help learners construct new knowledge. They do this both by providing a cue for recalling existing schemata and by providing a conceptual peg on which to hang new information.

One simple way to use advance organizers is to have learners survey chapter titles, subtitles, headings, summaries, and end-of-chapter questions before reading an assignment in a textbook. This stimulates prior knowledge that learners have stored in long-term memory. Then, as they read the chapter, they form connections between this knowledge and the incoming information, which promotes meaningful learning and long-term recall. The accompanying box, Using Advance Organizers, gives three examples of statements you could make in class to provide your learners with advance organizers for textbook readings and lessons.
Recognizing Learner Opinions, Beliefs, and Ideas. Learners who have little prior knowledge in a given area may have difficulty learning anything new. For example, suppose you were teaching a unit on World War I and you began by focusing on specific facts and details about which your learners had little prior knowledge. As a consequence, the learners would be unable to build bridges to what they already know, they would not make an effort to construct their own understanding of what is being taught, and, at best, they would passively attend to your lesson. On the other hand, if you recognize that your learners already have opinions, beliefs, or general notions about what your next lesson will cover, and if you try to organize this lesson around larger ideas that your learners can build on, they are more likely to engage in active thinking that results in meaningful learning and retention.

Anticipating Misconceptions. Cognitive psychologists caution that prior knowledge, in the form of misconceptions, may hamper the acquisition of new knowledge when these misconceptions are not anticipated by the teacher. For example, learners sometimes come to science classes with prior knowledge that is inconsistent with the content they are being asked to learn (DiSessa, 1982). Sometimes erroneous prior knowledge is so entrenched in the learners’ minds that they continue to use mistaken ways of thinking even when alternative methods have been taught (Roth, 1990, 1991). And sometimes prior beliefs are so strong that learners ignore statements that they disagree with or they choose not to believe what they see.

To show the power of prior knowledge, Gunstone and White (1981) constructed a demonstration involving a weight and a bucket of sand, which were hanging in balance on opposite sides of a pulley and extending downward an equal distance from the wheel of the pulley. A small amount of sand was added to the
bucket—so small that its addition caused no movement. Yet students who believed that the bucket would sink reported that they observed movement!

Next, the experimenters pulled the bucket down (which raised the weight) and asked students to predict what would happen if they let go of the bucket. Students predicted that the bucket would return to its original position, which it did not. Some students reacted to what they saw not by learning a new rule or generalization, but by trying to explain it away, arguing that something was wrong with the pulley.

The best way to ensure that your learners’ prior knowledge works to enhance meaningful and conceptually accurate learning is to ask these questions as you prepare a unit:

1. What important ideas, principles, generalizations, or beliefs do I want my learners to construct at the end of this unit?
2. How might this topic already look to my learners? How might they already perceive it or think about it?
3. What is the best way to represent or introduce these new ideas to my learners so that they connect them with what they already know and thus challenge the adequacy of their existing knowledge?

Challenge the Adequacy of Prior Knowledge

What is the best way to get your learners to compare what they know with what you are teaching? Constructivist educators propose that teachers deliberately plan their lessons to create “conceptual conflict” (Nussbaum & Novick, 1982).

For example, imagine introducing a biology unit on the body’s defense mechanisms with the following assertion: “Germs are not trying to hurt us when they settle in our bodies. They just want to live quietly, eat, and prosper.”
Undoubtedly, many learners view germs as targeting the body and intentionally harming it rather than as just wanting to find a way to reside peaceably in the new environment.

**Conceptual conflict** comes about when our existing beliefs or ways of explaining things don’t produce the outcomes we predict. You were first acquainted with this idea in Chapter 2 when you read about Piaget’s cognitive development theory and the process of disequilibrium. Conceptual conflict is a useful teaching tool in many different subject areas. Social studies teachers create conceptual conflict when they challenge long-established beliefs about the significance of certain events. Reading teachers create conceptual conflict when they ask learners to make predictions about what may happen next in a story. Science teachers create conceptual conflict when they ask learners to guess what will happen when a certain chemical is added.

Some cognitive psychologists and constructivist educators suggest that the most effective way to get learners to challenge the adequacy of prior knowledge is to design lessons that deliberately create the opportunity for conceptual conflict. They believe that learners will attempt to resolve the conflict by constructing new meanings for themselves and that they will thereby retain what they have learned and apply it in new contexts (Guzzetti, Snyder, Glass, & Gamas, 1993).

Posner, Strike, Hewson, and Gertzog (1982) developed an instructional framework teachers can use to promote conceptual conflict and resolution in science instruction that is applicable to any academic discipline. The accompanying box, *Creating Conceptual Conflict*, presents their recommendations.
Provide for Ambiguity and Uncertainty

Constructivist educators point out that problem solving in the real world rarely results in quick, simple, and correct solutions. Rather, real-world problems are complex, messy, and unstructured, and they often have multiple solutions. Consequently, such educators argue that the problem-solving situations in which we place learners should be “authentic.” **Authentic problems** are those that people encounter in the real world. They involve hands-on exercises or problems whose solutions are uncertain. Ideally, the tasks should yield multiple solutions, each with its own advantages and disadvantages. This creates the initial uncertainty and ambiguity necessary for meaningful learning to occur.

Many new approaches to instruction underscore the importance of ambiguity, complexity, uncertainty, and multiple solutions. Cognitive psychologists who study the development of writing skills, for example, urge that writing be viewed as problem solving (Scardamalia & Bereiter, 1986). They suggest that the task of writing involves problem exploration, planning, brainstorming, organizing ideas, testing for connections and coherence, editing, and revising. But writing typically has not been viewed as problem solving. Rather, Applebee (1984) reports that writing assignments, even in high school, tend to be limited in scope and confined to a narrow topic. The typical assignment is a first-and-final draft, one page or shorter in length, to be completed in class, and the topic is usually chosen by the teacher to test previous learning or skills. Hence the students’ task is to get the answer “right,” rather than to convince, inform, or entertain a prospective audience.

Since Applebee’s study, cognitive psychologists and constructivist educators have introduced numerous innovations into the teaching of writing (Atwell, 1987; Harris & Graham, 1992; Scardamalia & Bereiter, 1986). At the heart of these innovations is the notion that good writing instruction teaches learners to approach
writing as a problem-solving activity. Learners are encouraged to pursue their own topics for writing rather than writing on a teacher-prescribed topic. They also learn the importance of planning: establishing goals for writing, outlining, and identifying the important information they need to gather. Finally, they learn to revise their writing in light of their goals, a process that leads writers to change their goals and be flexible in light of inconsistent or contradictory information.

The accompanying box, *Teaching Good Writing*, suggests that writing from a constructivist point of view is much more than learners trying to convince their teachers that they learned what they were taught. Rather, it is a process of solving an unstructured problem through planning, writing, and revising. The goal of instruction is for learners to appreciate the complexity of the writing task and to view it as a way of communicating ideas that are important to them.

Teach Learners How to Learn

In the previous chapter you learned that good thinkers use cognitive strategies. These strategies allow learners to acquire and construct knowledge, across a variety of situations, that can be helpful to the learner over her entire life. We reviewed strategies to help learners remember, comprehend, write, and problem solve in a variety of academic areas.

A constructivist approach to classroom instruction includes cognitive strategies that teach students learning-to-learn skills and how to regulate those skills. Carl Bereiter, a prominent cognitive psychologist, refers to this goal of teaching as helping students become “intentional learners” (Bereiter, 1990). Students become intentional learners when they learn or find their own approaches or systems for achieving educational goals. Becoming an intentional learner requires the ability to find and allocate resources for learning, overcome obstacles to learning, and know how to sustain effort.
Intentional learners see themselves as being in charge of their learning—that is, they see themselves, not the teacher, as responsible for directing their learning efforts. In fact, cognitive psychologists have evidence that suggests that learners’ use of cognitive strategies depends on their willingness to accept responsibility for their own learning (Bereiter & Scardamalia, 1989; Resnick, 1989). In other words, they know how to monitor their understanding as they work. According to cognitive psychologists, better learners attend more closely to and assess more correctly the state of their understanding than do poorer learners (Browne, Bransford, Ferrara, & Campinone, 1983; Nelson-LeGall, Kratzer, Jones, & DeCooke, 1990; Resnick, 1989). The importance of learners’ knowing cognitive strategies and how to regulate their use is summarized by Bereiter and Scardamalia (1989) as follows:

By several different routes we arrive at the same conclusion: In order to learn what is ostensibly being taught in schools, students need to direct mental effort to goals over and above those implicit in the school activities. Without such intentional learning, education degenerates into the doing of schoolwork and other activities. (p. 385)

View Learning as a Joint Cognitive Venture

Instruction that is focused on knowledge construction is a joint cognitive effort rather than a solitary search for knowledge or an exclusively teacher-controlled activity (Bereiter & Scardamalia, 1989; Vygotsky, 1987). A joint cognitive venture is focused on a clear cognitive goal, and different components of the venture are carried out by different classroom participants: learner, peers, and teachers. According to cognitive instructional theory, genuine knowledge construction is not a solitary enterprise involving a learner working in isolation from peers and adults.
Research continues to document the superiority of collaborative cognitive ventures over individualistic ones (Slavin, 1990b). One benefit of collaborative learning is that less-informed learners acquire knowledge and learning strategies by observing and imitating more knowledgeable ones (Brown & Palincsar, 1989). A number of factors contribute to the importance of learning in a social context. Let’s look at some of them.

Conceptual Growth. Social or group learning is a principal force for promoting conceptual growth (Brown & Campione, 1986). Group instruction forces learners to accommodate their thinking to that of others. Conceptual growth is more likely to occur when learners have to think about the alternative viewpoints of group members, elaborate and defend their own ideas in the presence of others, and debate the merits of other viewpoints.

Social Support. Groups provide social support to their members in the form of encouragement and praise. Group instruction and group problem solving allow learners to assume different responsibilities (for example, researcher, recorder, summarizer, troubleshooter, supporter). Group members encourage one another to fulfill the responsibilities of these roles so that the group can accomplish its task.

Cognitive Modeling. When students are given the opportunity to learn in a social setting, they observe the thinking processes of group members as they carry out their roles. As group members argue and discuss with one another, thinking strategies often become explicit. Research into social learning demonstrates that children can learn good thinking from one another (Zimmerman, 1990). Thus students can learn how to define problems, brainstorm solutions, identify standards, collect data, and evaluate solutions by observing what different group members do.
Shared Expertise. Group learning assignments often involve different members learning different aspects of a large body of material. For example, a group project about the life of a famous scientist might require group members to acquire knowledge about different aspects of her life: education, culture, accomplishments, important historical events during her lifetime. Each member of the group becomes a subject specialist and communicates his or her knowledge to other group members. Thus, group learning becomes an efficient vehicle for acquiring new information (Slavin, 1985).

Assess a Learner's Knowledge Acquisition During Lessons

Most educators agree that testing is an important feature of successful instruction. But testing traditionally takes place after a lesson or unit of study is completed, or at the end of a semester or marking period. Cognitive psychologists, however, believe that separating tests from lessons this way can have unfortunate results (Wiggins, 1993). First, learners do not receive feedback on the adequacy of their answers until sometimes long after their actual performance. In addition, learners may miss the connection between what happens in class and what happens on test day, reducing the motivation both to learn in class and to study for tests. When assessment is embedded within the lesson being taught, learners receive immediate feedback, more easily see the connection between what was taught and what is being tested, and see that testing is an integral part of learning. Performance-based assessment, which we will study in Chapter 13, is an important aspect of constructivist teaching.

The seven elements of constructivist instruction presented above represent the roots of cognitive learning theory. In the next section we will look at some additional influences on cognitive learning theory and the instructional methods that have evolved from this theory.
Classroom Instruction that Promotes Good Thinking

As we have seen, cognitive learning theory emphasizes three related aspects of learning: (1) learning is a process of knowledge construction, not a matter of simply taking in what is heard or read; (2) because learners construct new knowledge based on what they already know, learning depends on prior knowledge; and (3) learning is an inherently social activity. This section describes several teaching methods based on cognitive learning theory: discovery learning, cognitive apprenticeship, cooperative learning, and direct explanation teaching. As you read about each one, ask yourself these questions:

1. Does this method allow learners to learn for themselves, or is knowledge already digested for them?
2. Does this method acknowledge that learners have preexisting ideas, information, and beliefs, or does it assume that their minds are blank slates?
3. Does this method allow learners to acquire and construct new knowledge through extended interactions with peers and adults, or is the learner viewed as a solitary investigator?

Discovery Learning

Take a moment to reread the fraction lessons of Mr. Robbins and Mrs. Greer at the beginning of this chapter. Mrs. Greer’s lesson closely followed the discovery learning ideas of Jerome Bruner. Bruner (1960) states that the mind organizes knowledge in a hierarchical fashion, with the more general, all-encompassing ideas at the top of the hierarchy, and the more concrete, factual ideas toward the bottom. Much of Bruner’s cognitive theory is built around the idea of
categorization or organization. He reasons that so much information comes in through the senses that the mind must find ways to simplify and make sense of it. **Categorization** is how the mind simplifies information that enters short-term memory. **Organization** involves arranging information in coding systems. Figure 6.4 shows an example of such a coding system for motivation. In it, different types and aspects of motivation are arranged in a hierarchy from most general at the top to most specific at the bottom.

Bruner theorizes that the mind spontaneously organizes information in a hierarchical manner with the organization of knowledge in long-term memory. He believes that all subject matter has a similar structure: facts are supported by concepts, which, in turn, are supported by generalizations. This structure of knowledge is illustrated in Figure 6.5.

These generalizations, concepts, and facts tell us how instruction should be organized. Bruner stipulates that good teaching involves helping learners *discover for themselves* the generalizations under which lie related concepts and facts, rather than simply *telling them* to the learner. This *discovery learning* is facilitated when teachers organize the knowledge they present around fundamental themes and principles rather than discrete facts. This type of organization is similar to the way in which knowledge is organized in long-term memory.

Mrs. Greer has identified the important facts, concepts, and generalizations of her unit on fractions. But rather than teach children directly the rules and techniques for mathematically manipulating fractions in order to compare them (as did Mr. Robbins), she tries to help her learners *construct* the rules and generalizations for themselves. By doing so, Mrs. Greer (and Bruner) believe that students will have greater retention, understanding, and ability to use knowledge about (in this instance) fractions to solve future problems.
The essence of discovery learning is that the important facts, concepts, and
generalizations of a subject area are not presented to learners in a final, organized
form. Rather, they are taught in such a way that learners discover the relationships
among facts, concepts, and generalizations and organize them in long-term
memory on their own. According to Bruner, teaching by the discovery method
makes it more likely that learners will remember new knowledge and be able to
apply it to solve real-world problems (Bruner, 1961).

Basic Features. Classroom instruction that is built around discovery learning has
five important features: instructional set, motivational set, knowledge base,
multiple examples, and hierarchically organized curriculum. Let’s see what each
contains.

*Instructional set* is the purpose or goal the teacher gives the learners at the start
of the lesson. As we stated above, students can view learning as activities to be
completed, or they can view it as an end in itself. In discovery learning, the
teacher explains the purpose of the lesson in a way that is appropriate for the
developmental level of the student. For example, you might tell kindergartners,
“Today we are going to look for patterns using these blocks and buttons”; you
would tell fourth-graders, “Work with these tiles to see how many different
number patterns you can show. Then we’ll write our results in numbers and
letters”; to high school students, the message would be, “We are going to derive
the equations for the graphs you drew yesterday.” In this way learners approach
the task with the goal of acquiring understanding rather than memorizing facts,
filling out a worksheet, or taking a test.

*Motivational set* involves what the teacher does to stimulate, excite, or arouse
learners to accomplish the goal of the lesson. We will have more to say about
motivation in the next chapter.
Knowledge base refers to the extent of a learner’s declarative and procedural knowledge relevant to the content of the lesson. As we discussed in the previous chapter, good thinkers possess a lot of knowledge. Thus, learners are more likely to see important relationships and discover important principles and generalizations if they have acquired the specific information necessary to do so.

Multiple examples means giving learners as many different instances or circumstances as possible in which the knowledge they are about to learn is included. For example, if the purpose of the lesson is to help learners discover how supply and demand affect price, you would provide a number of different examples: low interest rates cause people to refinance their mortgages, drought causes higher food prices, handmade sweaters are more expensive than mass-produced ones. Furthermore, discovery will be facilitated if you present the material through a variety of sensory modalities (audio, visual, tactile, and so forth).

A hierarchically organized curriculum stresses that the curriculum itself must be organized along the lines of a hierarchy of generalizations, concepts, and facts. Bruner feels that teachers must plan their lessons with an understanding of the hierarchical structure of the information they wish to convey. In that way, learners are exposed to specific facts from which they discover new concepts, from which they in turn derive generalizations.

As you read the following example of discovery learning, try to identify how it incorporates the five elements—instructional set, motivational set, knowledge base, multiple examples, and hierarchically organized curriculum.

An Example. Here is a principle of force and motion that Mr. Lyon will be teaching his junior high school science students:
The turning effect of a force depends, in part, on how far the force acts from the center of turning (which is called the axle or pivot).

Rather than simply explaining this principle to his learners and giving them examples, Mr. Lyon devised a lesson to help them discover it on their own.

Since he would be using terms and expressions like force, turning effect, and center of turning, Mr. Lyon first ensured that his learners were familiar with the required terms. Then he brought to the classroom devices that make use of the principles of force and motion and arranged them on a table. These included nuts and bolts of various sizes, a variety of manual can openers and cans, socket wrenches of various lengths and sizes, hand-operated drills of various lengths, and paper clips.

At the start of the class he divided his students into pairs and gave each pair one paper clip. He instructed each pair to straighten the paper clip, and then have one partner hold one end and make it turn in the other partner’s fingers without bending it. He asked them to note if it turned easily when the partner really squeezed the wire.

Next, he told them to make a right-angle bend in the wire about two centimeters from either end. He instructed one partner to turn the bent part as a crank, while the other squeezed the wire to keep it from turning. He asked them to note who was more successful. If both tried to turn the wire in opposite directions, who succeeded?

Finally, before allowing the pairs to experiment with the various tools and devices arranged on the table, Mr. Lyon told them that he wanted the groups to explain to him at the end of the lesson what causes a force to have a greater turning effect.
Goals for Discovery Learning Lessons. Here are some important generalizations that could serve as goals for discovery learning lessons. Think about the knowledge required of learners to discover the generalization and try to plan a lesson (with examples, visuals, and necessary apparatuses) to help them do so:

- Measurements are really comparisons with other known or accepted dimensions.
- The number of swings a pendulum makes in a given period of time depends mostly on its length.
- Major civilizations usually developed at the confluence of rivers and near natural harbors.
- Assuming no change in the quantity demanded by consumers, if producers increase the supply of a given good or service to the marketplace, then the price of that good or service can be expected to fall.
- Elderly people tend to vote in greater numbers than do voters of ages 18–21.

The accompanying box, *Teaching by the Discovery Method*, contains some suggestions for teaching generalizations like these in a discovery learning lesson.

Cognitive Apprenticeship

Classrooms traditionally have been successful places for conveying large bodies of information. They have not been as successful in teaching learners how experts gather or use that information. The notion that learners must become more skilled at gathering and using knowledge for themselves, and that the best way for them to do this is to observe experts while they are engaged in these processes, has given rise to several constructivist teaching approaches referred to as **cognitive**
Cognitive apprenticeship is a model of teaching and learning that views the classroom learner as a novice who will be apprenticed to an expert. In a cognitive apprenticeship, the novice learns the cognitive strategies and metacognitive skills necessary to handle complex learning tasks. The teacher’s role is not to fill the learner’s mind with information, facts, and procedures, but rather to teach the “apprentices” how to explore, organize, question, and learn independently.

Cognitive apprenticeships are focused on teaching strategies and metacognition and are organized around specific learning areas such as reading, math, or writing. Thus, a novice learner learns strategies of expert thinking in a specific field: how a journalist writes, how a historian studies the past, how a mathematician solves problems. The facts and concepts that the student learns during a cognitive apprenticeship are those that are important in the expert’s chosen field.

Basic Features. Cognitive apprenticeships can be organized in any field of study: science, social studies, literature, art. The most common models are in the areas of math (Schoenfeld, 1983, 1985), reading (Palincsar & Brown, 1984; Rosenshine & Meister, 1994), and writing (Scardamalia & Bereiter, 1985). All have common features: (1) they teach cognitive and metacognitive strategies, and (2) the skills learned are specific to an academic discipline (math, reading, writing, and so on). Collins, Brown, and Newman (1989) call these conditions situated learning. Other common elements of cognitive apprenticeships are the use of modeling, coaching, scaffolding, articulation, and reflection.

We have already discussed modeling in connection with the important work of cognitive social learning theorists. For novice learners in reading, math, or
writing, modeling means they see and hear their teachers explain how they go about doing things. They hear their teacher thinking through a math problem. They hear and see their teacher as he reads a piece of writing and figures out how to revise it. They listen to their teacher as she explains how she determined the main ideas of a story. The challenge to the teacher is to make explicit these thinking skills, which are usually carried out automatically and covertly.

Consider how you would model for your learners the thinking strategies used to solve the following problem: “The price of bananas is four for 51 cents. What is the cost of one dozen bananas?” An expert math problem solver might think aloud to her learners like this: “Well, how do you solve a problem like this? What does the problem tell me? I know four bananas cost 51 cents. One way in which to find out how much a dozen cost is to find out the price of one banana. How can I find out how much one banana costs?”

The teacher then writes on the board while speaking to the class: “Let’s see, 51 cents divided by 4 equals 12.75 cents for one banana. Now, if I multiply 12.75 cents by 12 bananas, I’ll get the cost of all the bananas. So, the cost of a dozen bananas is $1.53. By finding out how much one banana costs, I can find out how much any number of bananas cost.”

Coaching occurs during apprenticeships when a teacher observes his learners’ attempts to imitate expert problem solving, writing, or reading while he offers feedback, hints, and guidance. As the teacher watches the learners, he may offer additional modeling, explanation, or suggestions.

Scaffolding is a technique for providing guidance to learners as they practice. The key to good scaffolding is to achieve the right balance between too much support and too little. Offering too much help to learners as they attempt to master a strategy can diminish their motivation to complete the task on their own, while
providing too little assistance can quickly lead to frustration (Rosenshine & Meister, 1992).

Scaffolding occurs when a teacher recognizes that a learner is in need of assistance and offers prompts, suggestions, and hints to help the learner solve the problem. As soon as the teacher sees that the “scaffold” is working, she gradually begins to remove the prompts and cues used to construct it. Expert scaffolding requires that the teacher be familiar with the demands of the task, and that she anticipate the difficulties the learners are likely to encounter.

The accompanying box, Using Scaffolding, shows how a teacher uses scaffolding to teach a small group of learners how to read a contour map. Notice how the teacher guides the learners with questions, hints, and cues, and then removes this support as the learners begin to respond correctly.

Good scaffolded instruction involves getting learners to explain the reasoning they used or the steps they went through to solve a particular problem. This is your way of determining if the learner understands the process that you have modeled. This stage of cognitive apprenticeship is called articulation. It involves learners’ explaining to the class what they are doing. For example, you might ask a learner to think out loud as he is solving a math problem. Or in reading, you might ask a learner to articulate why one sentence is a better topic sentence than another. In the example of scaffolding given in the box, the teacher might ask: “What does it mean when contour lines are very close together? How is this important in planning a trip?”

In the final stage of a cognitive apprenticeship, the teacher asks learners to compare their methods of solving a problem or their use of a particular strategy with that of an expert. This is called reflection. In the example of map instruction, the teacher could have given the learners a copy of the route she planned and asked them to compare it to the one they had chosen. The teacher would then ask
each learner to describe the steps he or she used to plan the route, to compare them with the teacher’s route.

Example: Reciprocal Teaching. Cognitive apprenticeship can be applied in your classroom with a strategy called **reciprocal teaching** (Palincsar, 1987). Reciprocal teaching provides alternative representations or elaborations of the content to be learned through the vehicle of group discussion. At the center of reciprocal teaching are group discussions in which students and teacher take turns leading discussions about the text. Gall (1984) observed that most discussion that takes place in classrooms amounts to little more than recitation of facts by students with the aid of question-and-answer sequences in which all or most of the answers are known. This leaves little opportunity for students to construct their own meaning and interpretation of content in order to reach higher levels of understanding. Most classroom discussions are further driven by content in the text, representing rapid-fire questions and answers that stay close to the facts as they are organized and presented in the textbook.

Reciprocal teaching attempts to make class discussion into a more productive and self-directed learning experience. It accomplishes this through four activities—**predicting**, **questioning**, **summarizing**, and **clarifying**—which unfold in the following sequence, as described by Palincsar and Brown (1989). In the **predicting** stage, the discussion begins by generating predictions about the content to be learned from the text based on (a) its title or subheading in the text, (b) the group’s prior knowledge about the topic, and (c) the group’s experience with similar kinds of information.

After the group members predict what they expect to learn from the text, the group reads and listens to a portion of it. Next comes the **questioning** stage, in which one learner leads a discussion of each portion of the text that was read. The
discussion leader asks questions about the information in the text, and students respond and raise additional questions.

In the **summarizing** stage, the discussion leader summarizes the text, and other students are invited to comment or elaborate on the summary. In the final, **clarifying** stage, points are discussed until clarity is achieved. In this case, more predictions may be made and portions of the text may be reread for greater clarity.

The accompanying box, *Employing Reciprocal Teaching*, illustrates the four activities of predicting, questioning, summarizing, and clarifying that comprise reciprocal teaching. Notice how the teacher supports the students’ participation in the dialogue. The teacher’s aim is to engage as many students as possible in the learning process. This is accomplished by elaborating on student responses and allowing ample opportunity for students to participate in the dialogue from their own perspectives. As the discussion continues, more responsibility for reading and developing the dialogue is gradually given over to the students until, over time, the teacher becomes more of an advisor—or coach—whose role is to refine, not provide, the appropriate responses. By the end of the discussion, the students’ responses represent their own internalizations of the text.

The goal of reciprocal teaching is to sufficiently engage students in the learning process, by whatever means, so that they become conscious of their reasoning process and refine it through their own, other students’, and the teacher’s modeling of that process in the context of classroom dialogues. To attain this goal, teacher and learners together must continually monitor both the meanings students are deriving from the text and the ongoing dialogue. The teacher must also continually adjust the instructional content to meet the students’ current levels of understanding. As students gradually accept the shift in responsibility from teacher to student, the teacher reduces the amount of
explaining, explicitness of cues, and prompting that marked the earlier part of the lesson. Figure 6.6 lists and describes some classroom activities that represent the gradual shift of responsibility from teacher to learner during reciprocal teaching. The accompanying box, Using Reciprocal Teaching, presents some key summary points.

Cooperative Learning

**Cooperative learning** is a teaching activity that involves a heterogeneous group of students who are responsible for one another’s learning of a common goal (Slavin, 1991). In most classrooms, learning is not cooperative but, rather, individualistic or competitive. *Individualistic learning* occurs when the student works independently to achieve some learning goal. The success or failure of this effort depends on the learner’s efforts and is unaffected by the achievement or lack of achievement of other class members. In *competitive learning* classrooms, student performance is judged against the typical or average performance of all class members. Grades are assigned as a reference to the performance of the class as a whole.

In cooperative learning, students are organized into small groups, each with an objective to accomplish. The lessons are structured so that the group objective can only be achieved if all group members perform their assigned tasks. A learner’s final grade is a combination of the group score and an individual score. Slavin (1991) has found that such groups attain higher levels of academic achievement across a variety of subject areas in comparison to more traditional classroom learning structures (Fantuzzo, King, & Heller, 1992).

Cooperative learning, like other constructivist approaches, is suitable when the teacher’s goals involve the learning of problem-solving skills, cognitive strategies, meta-cognitive knowledge, or social interaction skills. It is not an efficient method
for learning factual knowledge or simple procedural routines, such as subtraction or multiplication skills (Pasch et al., 1991).

Basic Features. Cooperative learning encompasses a variety of cooperative learning models. Several specific cooperative learning activities suggested by Slavin are listed in the accompanying box, *Using Cooperative Learning Activities*. Each of these activities incorporates the most important features of a cooperative learning lesson: heterogeneous grouping, positive interdependence, individual accountability, and interpersonal skills (Cohen, 1986). Let’s now look more closely at each of these.

During cooperative learning, students are arranged into *heterogeneous groups* of four to five learners. Group members should be diverse in terms of gender, ethnicity, scholastic achievement, and interpersonal skills. The teacher thereby ensures that each group contains a range of achievement levels in the subject area, gender and ethnic proportions that reflect the composition of the class as a whole, and a mixture of socially assertive and nonassertive learners. Slavin and others have found that such arrangements not only promote high levels of scholastic achievement; they also have positive effects on intergroup relations and self-esteem (Schmuck & Schmuck, 1992; Slavin, 1991).

Cooperative learning lessons should foster *positive interdependence*. In other words, activities are planned so that group members depend on one another for the accomplishment of the group’s goal. If, for example, the objective of the lesson is to conduct a critical review of *Lord of the Flies*, then each group member is assigned a different responsibility. For example, one member may examine characters; another, plot. One member may be responsible for synthesizing the ideas discussed, while another writes them down. Each member must complete his or her task, or the group will not achieve its goal. Table 6.1 lists some cooperative
student roles that can be assigned to encourage positive interdependence, suggested by Johnson and Johnson (1991).

Positive interdependence can also be achieved when each learner receives a group participation grade in addition to an individual grade. For example, individuals can rate each other on a five-point scale that measures active group involvement. The average of all scores assigned by the team members would be each learner’s score for individual effort. Another method is for you to rate the group’s end product on a five-point scale. Sample scales for measuring group and individual effort are illustrated in Figure 6.7. Scores from these scales can be recorded either independently of one another (e.g., individual effort=4, group product=5) or as a ratio (e.g., 4/5=.80). If the ratio method is chosen, each individual in the group is given the same group score, determined either by you or by averaging all group members’ evaluations of each other. Ratios smaller than 1.0 indicate that the group product exceeded this individual’s contribution. Ratios greater than 1.0 indicate that the individual’s contribution exceeded the group product.

One reservation expressed about cooperative learning concerns whether individual learners will feel responsible for their own learning or, instead, let others do all the work. However, cooperative learning builds individual accountability through peer pressure and individual assessments. For the group to succeed, every member has to fulfill his or her assigned responsibilities. If one student slacks off, every group member’s grade or evaluation suffers. In addition, teachers give learners individual tests or assignments to assess learning and rate the performance of each member in terms of how it contributes to overall group success. Thus, each student’s final grade includes a group grade, an individual test grade, and a rating of how well he performed certain interpersonal skills important for positive group functioning.
The final feature of a cooperative learning lesson is the teaching and evaluating of *interpersonal skills*. Effective group functioning requires that learners be prepared to elicit and listen to one another’s opinions, reflect on what has been said, give reasons for their statements, and allow everyone to contribute (Cohen, 1986). Thus a central feature of cooperative learning is preparing learners to cooperate. The accompanying box, *Teaching Collaborative Skills*, suggests some ways you can teach these important skills in your classroom.

An Example. Finally, we will illustrate some of the steps you would follow to plan a cooperative learning lesson. Our example concerns a high school English teacher named Mr. Fox, who decided to include cooperative learning lessons in his unit on characterization in *Lord of the Flies*. Excerpts from the lesson described here can be seen on the videotape that accompanies this text, *What Teachers Need To Know*.

**Establish Objectives.** Mr. Fox set the following objectives for his cooperative learning lessons:

1. Students will be able to associate important human personality traits with each of the main characters.
2. Students will learn a strategy for identifying traits of characters.

**Make Organizational Decisions.** Mr. Fox decided to set up six groups, with five learners per group, mixed by gender, ethnicity, reading achievement, and level of assertiveness. The groups were arranged in circles, with space between the groups.

The group assignment was to reach consensus regarding what each character represents and then summarize to the class what was said within each group about the following questions:
1. How would things have been different if only girls were on the island or if there were girls and boys?

2. Would there be different personality traits represented among the main characters if girls were on the island?

3. If you were on the island, how would the story be different?

Prepare Materials. Each learner had a copy of the novel and a recording sheet to complete the individual assignment. Each group received a response sheet to record the results of the group assignment.

Determine Individual Roles. Mr. Fox decided to assign the following roles to group members (refer to Table 6.2): observer/troubleshooter, recorder, checker, supporter, and researcher.

Select Procedures. Mr. Fox used the following procedures to conduct the cooperative learning activity:

- **Reviewing**: Begin class with review of main personality traits of characters.
- **Structuring**: Explain goal of lesson. Explain group and individual responsibilities.
- **Modeling**: Demonstrate process of character analysis. Model social skills.
- **Coaching**: Move from group to group. Clarify, model, question, give feedback.
- **Fading**: Gradually let groups work more and more independently.

Conduct Evaluation. Each group turned in a completed worksheet, and each student turned in his or her own worksheet analyzing each character. Using a rating sheet, Mr. Fox rated each learner’s performance of the following social
skills during the lesson: (1) completes role responsibility; (2) uses praise; (3) explains concisely; (4) disagrees appropriately; (5) asks for clarification.

Direct Explanation Teaching

**Direct explanation teaching** is a label for a variety of teaching methods that make explicit to learners at the outset of a lesson the academic competencies, strategies, generalizations, or procedures to be taught (Pressley, 1995; Roehler & Duffy, 1984). It encompasses such teaching models as *expository learning* (Ausubel & Robinson, 1969) and *reception learning* (Ausubel, 1977), and includes some elements of the *direct teaching model* (Rosenshine & Stevens, 1986).

Many have questioned whether direct explanation is “constructive enough” to be identified as a constructivist instructional practice. Pressley explains its constructivist roots this way:

Direct explanation is a decidedly constructivist approach: Students do not passively learn from explanations but rather actively learn from them. They do not completely understand what the teacher is saying or doing, but the teacher’s explanation and modeling are a starting point for the student. As the student struggles with the process the teacher modeled, he or she adapts it to the particular tasks at hand and modifies it in ways that are sensible to him or her. If a classroom of children hears and watches a demonstration (e.g., of multiplication of fractions) and then practices what was taught in the lesson, there will be much struggling, adaptation, and reflection on the part of the students, with the result that at the end of the instructional day, all will have somewhat different understandings of multiplication of
fractions....Our view is that direct explanation is...the start of active exploration. (Pressley, Harris, & Marks, 1992, pp. 7–8)

Basic Features. The most critical feature of direct explanation is the teacher’s description, modeling, or demonstration of cognitive strategies. The teacher models the use of cognitive strategies in an authentic context and in an authentic manner. The students hear and see the teacher struggle with the task and arrive at new strategies to accomplish it. Students thus deepen their understanding and appreciation for the significance of the “cognitive struggle” in learning when they observe teachers coping with difficult tasks (Schunk, Hanson, & Cox, 1987). The key ingredients of direct explanation teaching are up-front demonstration and explanation of the lesson goal, mental modeling of authentic problem solving, guided practice, and provision of metacognitive information. Let’s learn more about each of these.

**Up-front Demonstration and Explanation.** Up-front demonstration and explanation of the lesson goal requires that the teacher begin the class by telling learners what they should expect to get out of the lesson. Many models of good teaching emphasize the importance of capturing learners’ attention at the start of a lesson and letting them know what they are going to accomplish. Hunter (1982) refers to this as *anticipatory set*. During this phase of direct explanation teaching, the teacher presents a task to learners that requires the use of a problem-solving strategy. The teacher informs the students that they will need the strategy to complete the assignment and then explains the strategy to them.

**Mental Modeling of Authentic Problem Solving.** During mental modeling of authentic problem solving, the teacher thinks aloud to the learners and shows them how to apply a particular cognitive strategy. However, mental modeling involves more than just thinking aloud. It also involves saying things that indicate to
learners that you are struggling or puzzling over the task. Statements like, “I’m stuck at this point. I have no idea where to go. What should I do next?” make this clear to learners. The problem should be authentic— that is, one that people encounter in their daily lives.

**Guided Practice.** During guided practice, the teacher uses prompts, questions, and hints to get learners to use the strategy that was modeled. Feedback, praise, and encouragement from the teacher accompany the learner’s efforts. The level of assistance is determined using scaffolding techniques. As learners become more successful using the strategy, the teacher gradually fades the “scaffold” by providing fewer hints, questions, and prompts until the learner can use the strategy independently.

**Metacognitive Information.** In the previous chapter we discussed the importance of teaching cognitive strategies to learners so that they can become good thinkers. We also pointed out that learners do not always use strategies, despite their proven effectiveness. Therefore, during direct explanation instruction, teachers provide learners with metacognitive information about the strategy they are using. For example, one would model when and where to use them and how to notice or monitor whether they are helping. This involves (1) showing learners how to assess or monitor the effectiveness of a strategy, (2) prompting them to attribute their own improvement in performance to the strategy, and (3) prompting them to make a commitment to use the strategy in the future.

An Example. The following classroom dialogue illustrates the steps in a direct explanation lesson.

**Step 1: Introduce the Lesson.** “Today we’re going to write something on great conquerors in history. Now, I bet you’re thinking, ‘I don’t know anything about great conquerors.’ That’s a common reaction of a lot of writers, even those who
write for newspapers like this one.” (Holds up a copy of the local paper.) “Today you’re going to learn that you know a lot more than you think. I’m going to show you how to search your memories for what you know about a topic. At the end of the lesson you will be surprised by how much you know about great conquerors and will be ready to write about them.”

**Step 2: Introduce the Strategy.** “To show you how to do this, give me a topic to write about that you don’t think I know anything about.” (Student raises hand and says “rock stars of today.”) “That’s a good one. Now listen while I ask myself questions to search my memory for what I know about rock stars of today.”

**Step 3: Mental Modeling.** “First, I’ll try to search my memory for the name of a rock star. I can’t think of the name of even one! So, I say to myself, ‘Has anything happened in the news recently about a rock star?’ Wait! I remember reading about Kurt Cobain! By asking myself a question about current events, I was able to remember Cobain’s name. But, what do I know about Cobain and his music? So, I ask myself, ‘What did the paper say?’ I remember reading that he died. But what kind of music did he play? I know the article said something about his music, but I can’t remember. OK. What different kinds of music are there? I know there’s heavy metal, alternative rock, grunge rock. That’s it. Now I remember. Cobain played grunge rock.”

**Step 4: Provide Guided Practice.** “Now let’s use this strategy for searching your memories to find out what you know about great conquerors. Look at the overhead to help you. It shows the steps I used.” (Students view overhead listing cues to jog their memories.) “OK, Pete, show me how to use this strategy to find out what you know about conquerors.” (Pete mentally models the use of the strategy and comes up with the names Genghis Kahn, Attila, and Caesar.) “Good job, Pete. Now, let’s see if someone can use the strategy when they don’t see the
overhead.” (Teacher turns off the projector, fading support.) “Would someone else like to use the strategy to search their memory for the names of great conquerors? Maria, what would you do first to help you recall what you know?” (Maria hesitates.) “What’s something you could say to yourself to get your memory working?” (Teacher builds scaffold of support for Maria.) Maria says, “Recall stories I’ve read about history and wars.” “That’s good, Maria.”

**Step 5: Teach Metacognitive Knowledge.** (At the end of the lesson.) “Now that you’ve used the strategy to search your memory, I bet you’re surprised at what you remembered. Think back to the start of the lesson when you thought you didn’t know anything about great conquerors.” (Teacher got learners to monitor strategy effectiveness.) “Did you remember more than you thought? Well, that was the strategy working for you. (Teacher prompted learners to attribute improvement to the strategy.) “Now that you used the strategy successfully, you have to be sure to use it with other writing tasks. What other topics might you want to write about where this strategy could help you?” (Student offers suggestion.) “Current events! That’s a good example. How might you use the strategy if you have to write something about the presidential election?” (Teacher provides metacognitive information about the strategy, when and where to use it, and how to monitor it.)

**Summary: Designing Constructivist Learning Environments**

In this chapter we have discussed a number of teaching practices that allow learners to be active during learning, construct knowledge and meaning for themselves, and control their own learning. We discussed four models of constructivist teaching: discovery learning, cognitive apprenticeship, cooperative learning, and direct explanation teaching. Whether you decide to use one of these
models or “construct” your own from elements of each, a commitment to constructivist teaching will involve:

1. Focusing on lesson content that teaches metacognitive knowledge.
2. Using teaching methods that promote learner activation.
3. Presenting lessons that teach learners to seek alternative methods and explanations.
4. Allowing learners to learn with and from their peers.
5. Emphasizing intrinsic motivation for learning so that students value learning for the meaning it has in their own lives.

In the next chapter we will take up the issue of intrinsic motivation and its integral role in constructivist teaching.

Summing Up

This chapter introduced you to constructivist theory and teaching methods. Its main points were these:

- Current cognitive models of learning and thinking stipulate that the mind learns not by passively recording or absorbing, but by actively trying to make sense of information.
- *Constructivism* is a term used by cognitive psychologists for how learners acquire meaning and understanding by organizing information for themselves, connecting it to other information, and storing it as networks or schemata.
- Cognitive psychologists view prior knowledge as a cognitive structure—or schema—that learners build for themselves. The teacher’s role is to help
learners gain entry to that knowledge, understand its conceptions and misconceptions, and swap inappropriate cognitive structures for better ones.

- An advance organizer is a summary of the concepts, generalizations, and themes to be learned presented at a general and inclusive level.
- Authentic problems are real-world problems that involve hands-on-exercises for which the solution is uncertain. Authentic learning tasks yield multiple solutions, each with advantages and disadvantages.
- Students become intentional learners when they find their own approaches or systems for achieving educational goals. This involves the ability to find and allocate resources for learning, overcoming obstacles to learning, monitoring their own work, and knowing how to sustain effort.
- Genuine knowledge construction is a joint cognitive venture focused on a clear cognitive goal. Different components of the venture are carried out by various classroom participants: learner, peers, and teachers.
- When tests are embedded within a lesson, learners receive immediate feedback, more easily see the connection between what was taught and what is tested, and understand that testing is an integral part of learning.
- Discovery learning is a teaching strategy in which learners discover the relationships among facts, concepts, and generalizations, rather than receiving them in a final, organized form.
- Cognitive apprenticeship is a model of teaching in which learners become more skilled at gathering and using knowledge for themselves by observing experts.
- Cooperative learning is a teaching strategy in which heterogeneous groups of learners work together to accomplish a common goal.
Direct explanation teaching represents a variety of teaching methods that make explicit to learners at the outset of a lesson the academic competencies, strategies, generalizations, or procedures to be taught.

For Discussion and Practice

*1. Using your knowledge of the learning theorists studied in Chapters 4, 5, and 6, how would you categorize the respective approaches used by Mr. Robbins and Mrs. Greer to teach their lessons on fractions?

*2. In your own words and using an example from the classroom, explain what is meant by the term *constructivism*.

3. Provide an example of how you might involve your students in learning a primary concept, generalization, or underlying theme by building connections among ideas and facts.

*4. Identify several conceptual themes around which you might organize a lesson. What is the advantage of teaching concepts, generalizations, and underlying themes that span isolated bits of knowledge?

5. Identify two different advance organizers that you might use to introduce a lesson in your teaching area. How would they help your students recall prior knowledge?

*6. Explain what is meant by creating “conceptual conflict.” With what Piagetian concept do you associate this term?

7. Provide some examples of lesson topics that would create conceptual conflict.

*8. Compose a writing assignment for your grade or subject that represents the ambiguity, complexity, uncertainty, and multiple solutions required for meaningful learning to occur.
9. According to Bruner, what does good teaching involve? How did Mrs. Greer’s lesson at the beginning of the chapter embody Bruner’s concept of good teaching?

10. Plan a lesson by indicating how you would address each of the following features to promote discovery learning: instructional set, motivational set, knowledge base, multiple examples, and hierarchically organized curriculum.

11. Write the outline of a lesson plan for a cooperative learning activity in which you identify the lesson topic; establish its objectives; indicate your decisions pertaining to group size, arrangement, and assignment; specify materials; and determine individual student roles.

12. Write a brief classroom dialogue using direct explanation in which you (1) conduct a demonstration and explanation and (2) mentally model an authentic problem.

Suggested Readings

Brooks, J. G., & Brooks, M. G. (1993). The case for constructivist classrooms. Alexandria, VA: Association for Supervision and Curriculum Development. These authors have a wealth of experience with educational programs built upon constructivist learning principles. Their text offers many concrete examples of how these principles can be put into practice.


**Figure 6.1**
Mr. Robbins’s chart for teaching equivalent fractions.

**Figure 6.2**
Frank’s drawing. *Source: Teaching Academic Subjects to Diverse Learners* (pp. 67–69, 71, 182, 219), by M. M. Kennedy, New York: Teachers College Press. © 1990 by Teachers College, Columbia University. All rights reserved. Reprinted by permission of the publisher.

**Figure 6.3**
Rosa’s drawing. *Source: Teaching Academic Subjects to Diverse Learners* (pp. 67–69, 71, 182, 219), by M. M. Kennedy, New York: Teachers College Press. © 1990 by Teachers College, Columbia University. All rights reserved. Reprinted by permission of the publisher.

How can I help my students learn from their own beliefs and from the social environment in which they live?

**Constructivism.** An approach to learning in which learners are provided the opportunity to construct their own sense of what is being learned by building internal connections or relationships among the ideas and facts being taught.
How can I emphasize primary concepts, generalizations, and underlying themes rather than isolated facts?

Instructional practices based on constructivist principles allow learners the opportunity to construct their own ways of knowing.

How can I help my learners organize what they know in advance to get them ready to learn?

**Advance organizer.** A summary of the concepts, generalizations, and themes to be learned, presented at a general and inclusive level.

Applying Your Knowledge:

**Using Advance Organizers**

**For a Chapter in a History Book.** Some of the earliest visitors to America came from Europe. What drove these courageous explorers to sail across dangerous oceans in search of land they knew little about? What were they looking for, how did they get there and what did they find, what good and bad things did they bring to the new world? This chapter talks about the famous men, their ships, their journeys, their discoveries, and their successes and failures.

**For a Political Science Lesson.** Most nations have statements that express the basic principles on which their laws, customs, and economies are based. Today we will study three systems by which nations can guide, control, and operate their economies. The three economic systems we will study are capitalism, socialism, and communism. They often are confused with the political systems that tend to be associated with them. A political system not only influences the economic
system of a country but also guides individual behavior in many other areas, such as what is taught in schools, the relationship between church and state, how people get chosen for or elected to political office, what jobs people can have, and what newspapers can print. Tomorrow we will study the political systems that go along with each of the economic systems we will study today.

**For a Language Arts Lesson.** Today we will learn how to avoid embarrassing errors such as this when punctuating possessives [circle an incorrectly punctuated possessive in a newspaper headline]. At the end of the period I will give each of you several additional examples of errors taken from my collection of mistakes found in newspapers and magazines. I’ll ask you to make the proper corrections and report your changes to the class.

**Conceptual conflict.** The result when our existing beliefs or ways of explaining things don’t produce the outcomes we predicted.

Should I deliberately plan lessons that create conceptual conflict?

**Authentic problems.** Problems encountered in the real world for which the expected solution is uncertain and the task then yields multiple solutions, each with advantages and disadvantages.
Applying Your Knowledge:

Creating Conceptual Conflict

- Plan lectures, demonstrations, homework assignments, and other classroom activities that deliberately create inconsistencies between the important knowledge you want students to learn and what they actually know.
- Through questions, assignments, and other assessment devices, closely monitor your learners’ thinking about the to-be-learned ideas. Be alert to resistance to these alternative thinking frameworks.
- Model analytical or logical thinking for your learners to demonstrate that consistency in one’s beliefs and consistency with evidence is important.
- Represent new ideas to your learners in a variety of ways: verbal, pictorial, concrete-practical, and mathematical. Point out the relationships among the various ways of representing a problem and its solution.

How can I approach written work as a problem-solving activity?

Applying Your Knowledge:

Teaching Good Writing

Scardamalia and Bereiter (1986) have developed an approach to writing that incorporates many constructivist learning principles. Their approach, which is applicable to any content area or topic, stresses teaching strategies for planning, writing, and revising. Here are some of their suggestions:

Helping Learners with the Planning Stage of Writing
1. Have learners generate an idea for writing. Give them cue cards with the following statements on them to help them improve the idea: An even better idea is ——. An important point I haven’t considered yet is ——. A better argument would be ——. A different aspect would be ——. A whole new way to think of this topic is ——. No one will have thought of ——.

2. Learners should identify a goal for writing. Show your learners how to ask themselves questions about who the intended audience is, what are the needs of their audience, and what is the best way to give this audience what it wants.

3. Help learners generate content for their writing. Give your learners prompts on cards to motivate them to search their memories. For example, if they are writing about a sequence of events, the prompts might go something like this: What happened first? When did it happen? Where did it happen? To whom did it happen? and so on. Or provide cue cards with sentence openers like this: “One reason...” “Even though...” “For example,...” and “I think....”

Helping Learners During the Writing Stage

1. Show them how to get started. If your learners are writing a nonfiction piece, give them the following list: (1) generate a topic sentence; (2) note reasons; (3) examine the reasons and ask if readers will accept each reason; (4) come up with an ending. If your learners are writing a story, give them the following questions to answer: Who is the main character? Who else is in the story? When does the story take place? Where does the story take place? What does the main character do or want to do? What do the other characters do?

2. Show your learners how to elaborate on their ideas. Teach them to cue or prompt themselves with the following statements as they are writing: An example of this is...; This is true, but it’s not sufficient so...; My own feelings about this are...; I’ll change this a little by...; I could develop this idea by adding....
Helping Learners
During the Revision Stage
Show them how to improve their writing. Teach your learners to revise their writing by prompting themselves with the following statements: I’m not being clear about what I just said, so I should...; I could make my main point clearer by...; A criticism I should deal with in my paper is...; I’m getting off the topic, so I should....

**Intentional learners.** Students who find their own approaches or systems for achieving educational goals.

Intentional learners are students who learn or find their own approaches or systems for achieving educational goals.

**Joint cognitive venture.** An activity focused on a clear cognitive goal whose various components are carried out by different classroom participants: learner, peers, and teachers.

How can I make learning a joint cognitive effort between me, the learner, and the class rather than a teacher-controlled search for knowledge?

**Discovery learning.** The organization of knowledge around fundamental themes and principles rather than discrete facts.

**Categorization.** The process by which the mind simplifies information that enters short-term memory.
**Organization.** How the mind arranges information in coding systems for retrieving stored knowledge.

**Figure 6.4**
A coding system for human motivation.

**Figure 6.5**

Applying Your Knowledge:

**Teaching by the Discovery Method**

Here are some things to consider when planning and implementing a discovery lesson:

1. Choose an area you are very knowledgeable about and perhaps have already taught using more direct teaching approaches. This will ensure that you know the important facts, concepts, and generalizations that you want your learners to acquire.

2. Clearly identify the important principle, concept, generalization, or understanding that you want your learners to construct at the end of the lesson.

3. Start the lesson with a puzzling event, contradictory set of facts, or interesting object that will stimulate your learners to challenge and act on their prior beliefs.
4. Explain to your learners that the purpose of the lesson is for them to discover on their own how to resolve the puzzlement or doubt they are presently experiencing.

5. Offer a variety of materials to allow learners to act on their prior beliefs, to experiment, and to generate hypotheses.

6. Have your learners write down as best they can the generalization or rule they discovered.

7. Ask your learners to examine and discuss their thinking processes among themselves and with the entire class.

8. Lead your learners in discussions of their generalizations and the thinking processes that produced the generalizations. Present additional examples and ask them if each generalization works in these instances.

**Cognitive apprenticeship.** The notion that learners can best become more skilled at gathering and using knowledge for themselves by observing experts.

**Situated learning.** The teaching of cognitive and metacognitive skills specific to an academic discipline.

How can I model for my learners the thinking strategies they will need to solve real-world problems?
Applying Your Knowledge:

Using Scaffolding

**Teacher:** Today we’re going to figure out the best route for hiking from Point A to Point B on your contour map. There were five important things to remember in doing this. Who remembers one of them?

**Tammy:** Notice elevation changes.

**Teacher:** Good. Why is that important and how do you figure that out?

**Rose:** The steeper the trail, the longer it takes to reach your destination. The closer the contour lines are together, the steeper is the terrain. So on this map (points to a particular area), the terrain gets real steep right here.

**Teacher:** What’s another thing to consider when planning your route?

**Toby:** Water.

**Teacher:** What about it?

**Jonathan:** Where the streams are. Which way they’re flowing. How fast the water is flowing.

**Teacher:** Do you remember how we determined the direction of flow? (No answer) It had something to do with how the contour lines look.

**Tammy:** I know. The stream flows in the opposite direction in which the contour lines come together.

**Teacher:** OK, so tell me what direction the stream is flowing.

**Rose:** (Starts to speak and then hesitates.)

**Teacher:** Find where the contour lines join. OK. What do you notice about where the lines point?

**Rose:** They go this way.
Teacher: So which way does the stream flow? (Rose points) Good. Now how do we gauge how fast the water is flowing in the stream? (No response) Recall that you have to consider two things. (Pause...no response) One is to select a mile section of the stream and the other is ... (pauses)

Tammy: How far the land drops from beginning to end of that section.

Teacher: So, how fast is the water flowing?

Reciprocal teaching. Teaching that provides alternative representations or elaborations of the content to be learned through the vehicle of group discussion.

How can I use group discussion to allow learners to create their own representations and elaborations of the content to be learned?

Reciprocal teaching provides learners with an opportunity to construct their own meanings from what they read.

Applying Your Knowledge:

Employing Reciprocal Teaching

Teacher: (reading from text) The pipefish change their color and movements to blend with their surroundings. For example, pipefish that live among green plants change their color to a shade of green to match the plants.

Claire: (leading the discussion) One question that I had about this paragraph is: What is special about the way the pipefish looks?

Teacher: (clarifying) Do you mean the way that it is green?
Andy: (elaborating) It’s not just that it’s green; it’s that it’s the same color as the plants around it, all around it.

Claire: (continuing) Yes, that’s it. My summary of this part tells how the pipefish looks and that it looks like what is around it. My prediction is that this is about its enemies and how it protects itself and who the enemies are.

Monty: (adding to the summary) They also talked about how the pipefish moves....

Keith: (rejoining) It sways back and forth.

Andy: (adding) Along with the other plants.

Teacher: (questioning) What do we call it when something looks like and acts like something else? The way that the walking stick was yesterday? We clarified this word when we talked about the walking stick.

Angel: Mimic.

Teacher: That’s right. We said we would say that the pipefish mimics the... Students: (together) Plants.

Teacher: OK! Let’s see if Claire’s predictions come true. (Class turns to the text.)


Cooperative learning. A teaching method that uses heterogeneous groups of learners who are responsible for one another’s learning with respect to a common goal.

Figure 6.6

How do I plan cooperative learning lessons so that the group goal is achieved while individual group members take responsibility for their own learning?

**Applying Your Knowledge:**

**Using Reciprocal Teaching**

- Remember that the acquisition of the strategies employed in reciprocal teaching is a joint responsibility shared by the teacher and students.
- The teacher initially assumes major responsibility for teaching these strategies (the teacher “thinks aloud” how to make a prediction, ask a question, summarize, and clarify) but gradually transfers responsibility to the students for demonstrating use of the strategies.
- All students are expected to participate in the discussion and are given the opportunity to lead. The teacher encourages participation by supporting students in a variety of ways. For example, the teacher might prompt the student, provide additional information, or alter (raise or lower) the level of demand on the student so that a response meaningful to the student can be achieved.
- Throughout the lesson, the teacher consciously monitors the success with which comprehension is occurring and adjusts the content as needed.
Applying Your Knowledge:

Using Cooperative Learning Activities

Following are examples of four cooperative learning activities you can use in your classroom.

Students Teams-Achievement Divisions
1. Teacher presents content in lecture or discussion
2. Teams work through problems/questions on worksheets
3. Teacher gives quiz over material studied
4. Teacher determines team average and individual improvement scores

Teams-Games Tournament
1. Teacher presents content in lecture or discussion
2. Teams work through problems/questions on worksheets
3. Teams play academic games against each other for points
4. Teacher tallies team points over four-week period to determine best team and best individual scores

Jigsaw
1. Students read section of text and are assigned unique topics
2. Students within teams with same topic meet in “expert groups”
3. Students return to “home” group to share knowledge of their topic with teammates
4. Students take quiz over each topic discussed
5. Individual quizzes are used to create team scores and individual improvement scores

Team-Assisted Individualization
1. Students are given diagnostic test exercise by student monitor to determine placement in materials
2. Students work through assigned unit at their own pace
3. Teammate checks text against answers and student monitor gives quiz
4. Team quizzes are averaged and number of units completed are counted by monitor to create team scores

Figure 6.7

Table 6.1
Student Roles in Cooperative Learning
1. *Summarizer*—paraphrases and plays back to the group major conclusions to see if the group agrees and to prepare for (rehearse) the group’s contribution before the whole class.
2. *Checker*—checks controversial or debatable statements and conclusions for authenticity against text, workbook, or references. Assures that the group will not be using unsubstantiated facts, or be challenged by more accurate representations of other groups.
3. **Researcher**—reads reference documents and acquires background information when more data are needed (for example, may conduct an interview or seek a resource from the library). The researcher differs from a checker in that the researcher provides critical information for the group to complete its task, while the checker certifies the accuracy of the work in progress and/or after it has been completed.

4. **Runner**—acquires anything needed to complete the task, such as materials, equipment, reference works. Far from a subservient role, this requires creativity, shrewdness, and even cunning to find the necessary resources, which may also be diligently sought by other groups.

5. **Recorder**—commits to writing the major product of the group. The recorder may require individuals to write their own conclusions, in which case the recorder collates, synthesizes, and renders in coherent form the abbreviated work of individual group members.

6. **Supporter**—chosen for his or her upbeat, positive outlook, the supporter praises members when their individual assignments are completed and consoles them in times of discouragement (for example, if proper references can’t be found). Keeps the group moving forward by recording major milestones achieved on a chart for all the class to see, identifying progress made, and encouraging efforts of individuals, particularly those who may have difficulty participating or completing their tasks.

7. **Observer/Troubleshooter**—takes notes and records information about the group process that may be useful during whole-class discussion or debriefing. Reports to a class leader or to you when problems appear insurmountable for a group or for individual members.

**Direct explanation teaching.** A variety of teaching methods that make explicit to learners at the outset of a lesson the academic competencies, strategies, generalizations, or procedures to be taught.

Applying Your Knowledge:

**Teaching Collaborative Skills**

1. **Teach learners how to communicate their own ideas and feelings.**
   Encourage the use of “I” and “my” to let students know it is *their* ideas and feelings that make the collaborative process work. Show how personal experiences (events observed, problems encountered, people met) constitute a valued form of information that can be used to support and justify their own ideas and feelings.

2. **Make messages complete and specific.** Each statement should include a frame of reference, perspective, or experience. For example, “I got this idea while traveling through a Pueblo Indian reservation in southern Colorado during our vacation last summer.” Or, “I heard the President speak, and his main point reminded me of....”

3. **Make verbal and nonverbal messages congruent with one another.**
   Establish a serious tone and make it clear that hidden meanings and snide remarks are not acceptable. In other words, indicate that voice and body language should always reinforce the message being conveyed and that communicating serious information comically and overdramatizing confuse both the message and the listener.
4. **Convey an atmosphere of respect and support.** Demonstrate that all students can contribute information, ideas, feelings, personal experiences, and reactions without fear of ridicule. Make clear that unsupportive behaviors are not allowed. Show that cooperation rests on sharing both emotional and physical resources, receiving help, dividing responsibility, and looking out for one another’s well-being.

5. **Demonstrate how to determine if the message was properly received.** Teach your learners how to ask for feedback from listeners. For example, use phrases such as, “What do you think about what I said?” “Does what I said make sense?” “Can you see what I’m trying to say?” The more listeners are asked to paraphrase the message, the more the sender can be sure the message has been received as intended.

6. **Teach learners how to paraphrase another’s point of view.** Most learners will agree or disagree with the speaker without checking to see if they have understood the message. Teach students to paraphrase messages before they decide to criticize or support them.

7. **Demonstrate how to negotiate meanings and understandings.** Often one’s understanding of a message must be corrected, or fine-tuned, because the message was ambiguous, incomplete, or misinterpreted. This means that paraphrases must sometimes be recycled and brought to a higher level of understanding, for the benefit of both sender and receiver. Teach learners to use tactful phrases such as, “What I meant to say is...”; “What I forgot to add was....”

8. **Teach participation and leadership.** Communicate the importance of the following elements of group process (Johnson & Johnson, 1991, p. 135): *Mutual benefit*—what benefits the group benefits the individual.
Common fate—each individual wins or loses on the basis of the group’s overall performance.

Shared identity—everyone is a member of a group, emotionally as well as physically.

Joint celebration—everyone obtains satisfaction from the progress of individual group members.

Mutual responsibility—be concerned about group members who underperform.

Questions marked with an asterisk are answered in the appendix.