knowing is accompanied by understanding, important learning has occurred. Put me in a situation where I must use the same body of knowledge repeatedly, and habits of use eventually will entitle me not to have to look it up every time. Present me with a novel problem whose solution forces me to put together two pieces of knowledge previously mastered, and once I figure it out, that solution becomes part of my knowledge.

Think about the assessments Ms. W. had Emily involved in as she was learning to write. What were the foundations of knowledge that Emily needed to master? Among these were the attributes of good writing: word choice, sentence structure, organization, and so on. How did Ms. W. help Emily to mastery? Did she give her definitions of the attributes and performance rating scales to memorize? I think not. She helped Em and her classmates figure out what it was they needed to know and then she provided lots of repetitive practice in applying those standards of good writing. Emily came to know and understand them.

Time for Reflection

Identify at least five achievement targets that take the form of knowledge that you would expect students to master at the grade level(s) and in the subject(s) you teach or plan to teach. Also identify at least three knowledge targets you expect your students to know where to find.

Relationship to Other Targets

The foundation of academic competence rests on knowledge and understanding. I know that, for some, it is not trendy today to value learning the content. We are supposed to be attending to "higher-order thinking" and process skills. I agree that these, too, are important. But there is a danger lurking here.

In our haste to embrace "higher-order thinking," we deemphasize what we have a tradition of calling "lower-order thinking." But what have we traditionally defined as "lower order"? The mastery of content knowledge. So by deemphasizing content mastery, we in effect deny our students access to the very content they need to solve the problems that we want them to solve. Does that make sense to you? This is why you will find no reference to higher- or lower-order thinking in this book. Rather, we will honor both the ability to retrieve useful knowledge and the ability to use it to reason and solve problems.

Time for Reflection

Identify the academic discipline you regard as your greatest strength. How strong is your underlying knowledge of facts, concepts, and generalizations in that area? Think about your weakest area of academic performance. How strong is your knowledge and understanding base there? From this two-part analysis, what inference would you draw about how much a part of academic success is a strong, basic understanding of facts, concepts, and generalizations?

Reasoning Targets

Having students master content merely for the sake of knowing it and for no other reason is a complete waste of their time and ours. It is virtually always the case that we want students to be able to use their knowledge and understanding to reason, to figure things out, to solve certain kinds of problems. For example, we want them to

- Analyze and solve story problems in math because those problems mimic life after school
- Compare current or past political events or leaders because they need to be active citizens
- Reason inductively and deductively in science to find solutions to everyday problems
- Evaluate opposing positions on social and scientific issues because life constantly requires critical thinking

If we hold such targets as valuable for students, it is incumbent on us to define precisely what we mean by *reasoning and problem-solving proficiency.* Exactly what does it mean to reason "analytically"? It means that we take things apart to understand what's inside them. But what is the difference between doing this well and doing it poorly? That's the key question. What does it mean to reason "comparatively"? We do this when we think about similarities and differences. But when and how is that relevant? Another key question. What does it mean to categorize, synthesize, to reason inductively or deductively? What *is* critical thinking, anyway? Not only must we be clear about the underlying structure of these patterns of reasoning, but we must help students understand and take possession of them, too. And, of course, we must be ready to translate each pattern into classroom assessment exercises and scoring procedures.

Obviously, these patterns represent important forms of achievement. If we are to help our students learn to use their knowledge productively to reason and solve problems, we must understand that any form of reasoning can be done either well or poorly. Our assessment challenge lies in knowing the difference. Our success in helping students learn to monitor the quality of their own reasoning—a critical part of lifelong learning—is to *help them learn the difference.*

In the case of reasoning, as with the other kinds of achievement targets, we who presume to help students master effective reasoning must first ourselves become confident, competent masters of these patterns. In other words, we must strive to meet standards of intellectual rigor in our own reasoning if we are to make this vision come alive in our students' minds. If we do not, then we remain unprepared to devise assessments that reflect sound reasoning.

All Reasoning Arises from a Foundation of Knowledge

There is no such thing as "content-free" reasoning. My auto mechanic can diagnose the reason for my car problems in large part because he knows and understands the systems that make my car run. My attorney can help me with my legal problems because she has studied and learned the law. CPAs prepare taxes correctly because

they know proper procedures. My physician can help me get well because she knows the human body and understands medical remedies. Chefs create culinary delights because they know and understand how ingredients blend to look and taste good. You will develop sound assessments in your classroom in part because of the knowledge and understanding you acquire from studying the *content* of this book.

Students Are Natural "Thinkers"

With a few notable exceptions, our students arrive at school from day one with natural cognitive capabilities in place. You don't have to teach them to "think." Rather, you must help them learn to focus and organize their thinking into reasoning. The vast majority of students possess those cognitive abilities they need to survive and even prosper in school and beyond. Hidden within them is the capacity to interact purposefully with their world, confronting problems, reflecting on solutions, solving problems, and deriving or constructing personal meaning from experience.

But there's a problem. According to critical thinking expert Richard Paul (1995), the unschooled human mind is a mixed bag of good and bad thinking, of sharp focus and fuzzy thinking, of ignorance and sound knowledge, of accurate conceptions and misconceptions, of misunderstanding and important insight, of open-mindedness and prejudice. Our challenge as teachers is to help students learn to clean out and organize their mental houses as needed, to clear out the garbage and let sound reasoning prevail.

Patterns of Reasoning

How then should we understand and help students learn what it means to reason effectively? The answer lies in understanding how the ways we organize our thinking come together to solve problems. Let's start by exploring a few of the commonly referenced forms of reasoning. Then we'll explore their dynamic interrelationships.

In the real world, we frequently find instances of the need to see relationships by reasoning analytically, comparatively, or in an evaluative manner. Real-life thinkers need to be able to synthesize, classify, and reason inductively or deductively. Let's think together about what these inferring processes really mean.

As you read about these different ways of reasoning, you will see that each has its own definition. Each can be illustrated in understandable terms. Nevertheless, as the examples reveal, *reasoning patterns are rarely used independently of one another.* Rather, these patterns blend to bring us to problem solutions. For now, as you read about each pattern, take a few seconds to see if you can identify some of the ways they fit together. We'll discuss those connections later.

Just to be sure you see the path ahead, I intend to argue that students must understand these or similar patterns if they are to be able to use them productively to reason and solve problems. Therefore, they have a place among our valued achievement targets. We need to be ready to teach and assess student mastery of each. But more important, *we must prepare our students to be lifelong assessors of the quality of their own reasoning.*

Analytical Reasoning. Consider, for example, the performance arena of writing and the assessment of writing proficiency. Here we draw the distinction between holistic

and analytical scoring. In *holistic* scoring we consider all aspects of the written piece at once and base our judgment of quality on this overall impression, assigning one overall score. In *analytical* scoring, we break performance down into its component parts (word choice, organization, voice, and the like), evaluating and assigning a score to each part. It is this sense of the meaning of *analytical* that we are speaking of here.

When we reason analytically, we draw inferences about the component parts of something: its ingredients, how they fit together, and how they function as a whole. When good reporters do "news analysis" they go into a story in greater depth to study its parts. When we try to figure out how a machine works (to go inside and see how the pieces fit and work together) we are reasoning analytically. When we infer what goes into making something good, such as food, a movie, or a teacher, we are involved in analytical reasoning. Figure 3.5 presents a graphic representation of this pattern of reasoning, analyzing key assessment topics.

In this case, our instructional challenges are to be sure that students have access to whatever knowledge and understanding they need to analyze something and that they have guided practice in exercising their analytical thought processes.

Our assessment challenge is to ask them to tap into that knowledge base and apply their reasoning skills to a novel analytical task. For example, in literature, we might provide practice in character analysis by having students read a new story (gathering knowledge of a new character) and asking them to generate an original analysis of this character they have just "met."

As a teacher, I want my students to know exactly what is called for whenever I ask them to "analyze" something. I might even put a chart on the wall detailing the process and highlighting examples of analytical inferences. These might include character analyses from literature, storyline or plot analyses, breakdown diagrams of machines, or depictions of the subparts of a scientific process such as the water cycle. I want students to recognize when analysis is needed and to understand how to apply that pattern of reasoning in novel problem situations.

Synthesizing. Let's say you have just finished helping students analyze the structure of two short stories. Then, you have them pool or synthesize these into a set of generalizations about the typical structure of a short story. Thus two different sources of knowledge and understanding about short stories are integrated. This is *synthesizing*. You then ask them to draw the following inference: How does the story you just read align with what you know about the typical structure that you just developed? Figure 3.6 presents a description of synthesis.

We find a great deal of interest being expressed these days in the development of "integrated" or "thematic" instruction or curricula. This often is described as being different from discipline-based instruction, in which students study separately math, science, writing skills, and so on. Thematic instruction encourages students to bring knowledge and productive patterns of reasoning together from several disciplines, as they explore their particular theme, whether it be the study of a particular culture, scientific problem, or social issue. Such curricula place a premium on synthesizing insights from divergent sources and present wonderfully rich opportunities to develop and assess student mastery of this pattern of reasoning.

Questions that help students reason *analytically:*

1. What is it that I wish to analyze?
2. Why is analysis relevant?
3. What are the relevant parts, subdivisions, or categories?
4. How do the parts relate to each other?
5. How do the parts come together to create the whole?

Key concepts that underpin *analytical* reasoning:

- Interrelated parts of a whole
- Components
- Ingredients

Graphic representation of an example:

Reasoning Task: Analyze the ingredients of assessment quality covered in this book:

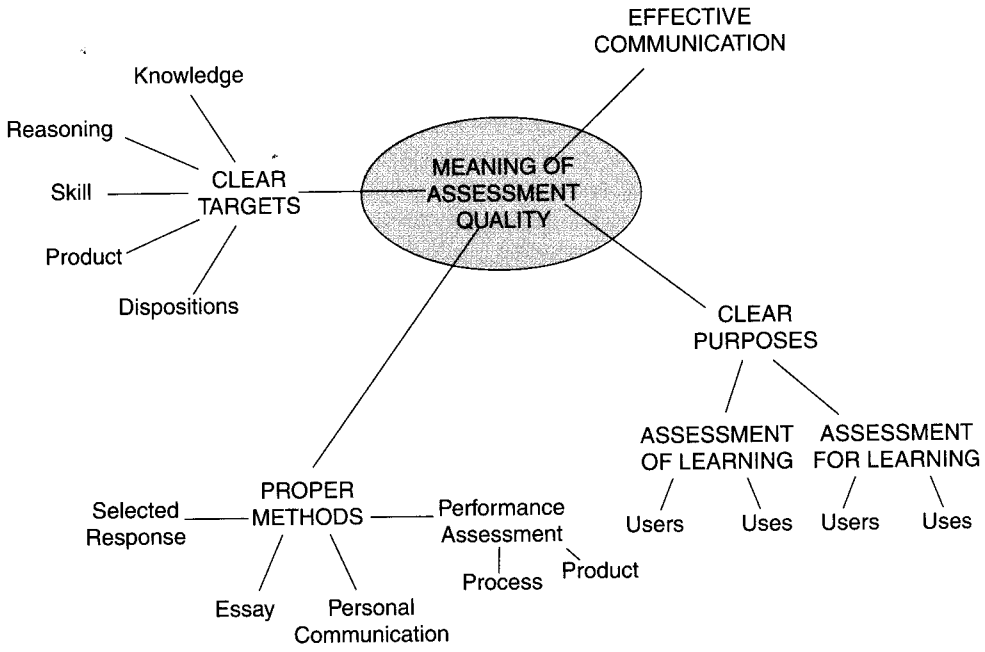

Figure 3.5
Understanding analytical reasoning

Comparative Reasoning. *Comparative reasoning* refers to the process of figuring out or inferring how things are either alike or different. Sometimes we compare in terms of similarities, other times we contrast in terms of differences, still other times we do both. To understand this kind of reasoning, we must see that those who are proficient begin with a clear understanding of the things they are to compare. They then identify the dimensions of each that they will examine for similarities or differences. And finally, they detail the comparison, highlighting why those particular points are important. Here are simple examples: In what way are these two poems alike and different? Given this early and this late work by this

Questions that help students *synthesize:*
1. What is the problem to be solved by combining ideas?
2. Why is synthesis relevant in this context?
3. What are the various understandings that can be combined to help?
4. How do those parts fit together to help us find a solution?

Key concepts:
- Convergence
- Generalization
- Whole is more than the sum of its parts

Example:
Understanding 1: My personal experience has shown me that students who are involved in the ongoing assessment of their own achievement are much more highly motivated to learn than are those who are not involved.

Understanding 2: The professional literature in both reading and writing instruction tells us that students must learn to monitor their own comprehension and the quality of their own writing to become independently literate adults.

Understanding 3: Research from around the world provides irrefutable evidence that students who are deeply involved in high-quality classroom assessment environments learn more.

Synthesis: It would be a very good idea for me, the teacher, to involve my students in assessment, record keeping, and communication to increase motivation.

Figure 3.6
Understanding synthesis as a pattern of reasoning

particular author, how are they different in style? How are these insects alike and different? Figure 3.7 illustrates the structure.

Classifying. Sometimes, life presents us with reasoning challenges that ask us to categorize, or *classify,* things. When we budget, we classify expenses. When we analyze how we use our time, we organize events into different categories. In science, we classify plants and animals. In politics, we categorize issues and candidates. To reason productively in this manner, we must first know the defining parameters of each category and the attributes of those things we are classifying. Then we can compare each item with the categorical options and infer its appropriate group (Figure 3.8).

Induction and Deduction. In the case of *inductive* reasoning, we reason productively when we can infer principles, draw conclusions, or glean generalizations from accumulated evidence. Induction results from synthesis. Reasoning travels from particular facts to a general rule or principle. Here are two examples:

- Now that you have read this story, what do you think is its general theme or message?

Questions that help students *compare* and *contrast:*

1. What is to be compared?
2. Why is it relevant to draw the comparison?
3. Upon what basis will we compare them?
4. How are they alike?
5. How are they different?
6. What important lessons can we learn from this *comparison*?

Key concepts:

- Similar
- Different

Example:

Compare classroom and standardized assessment

Criterion	Classroom Assessment	Standardized Test
Focus	Narrow Targets	Broad Targets
Developer	Teacher	Test Publisher
Frequency	Continuous	Once a year
Users	Teacher Student Parent	Principal Curriculum Director Superintendent School Board Legislator

Figure 3.7
Understanding comparative reasoning

- Given the evidence provided in this article about the stock market [note that this is an example of using knowledge gained through reference], what is the relationship between interest rates and stock values?

We help students gain control over their inductive reasoning proficiency when we make sure they have the opportunity to access the proper knowledge from which important rules or principles arise and when we provide guided practice in drawing inferences, conclusions, or generalizations.

We also reason when we apply a general rule or principle to find the solution to a problem. This is *deductive* reasoning. Here, reasoning travels from the general to the specific:

- Given your theory about criminal behavior, who did the killing?
- Given what you know about the role of a tragic hero in classic literature, if this character is a tragic hero, what do you think will happen next in the story?
- If the chemical test yields this result, what element is it?

Obviously, the key instructional challenge is to be sure students have the opportunity to learn and understand the rules, generalizations, or principles we

Questions that can help students *classify:*
1. Classify what?
2. Into what categories?
3. Why is it relevant to do so?
4. What elements into what categories?
5. What is the basis of (our reasoning behind) each proper match?

Key concepts:
- Objects have characteristics
- Categories have characteristics
- Alignment in terms of characteristics

Example:
Classify each instructional objective on the left in terms of the kind of achievement target that it represents.

Objective	*Target Type*
Read aloud fluently	Understand content knowledge
Know the causes of the Great Depression	Pattern of reasoning
Speak a second language fluently	Performance skill
Predict the results of an experiment	Product development
Set up the science lab apparatus properly	
Learn a poem	
Create a model dwelling	
Compare two characteristics from literature	

Figure 3.8
Understanding the reasoning that underpins classification

want them to apply. Then and only then can we assess their reasoning proficiency by presenting them with novel contexts within which to apply those rules.

Evaluative Reasoning. We reason in an evaluative manner when we apply certain criteria to judge the value or appropriateness of something. The quality of the reasoning depends on our ability to logically or dependably apply proper judgmental criteria. Synonyms for this pattern of reasoning include *critical thinking* and *judgmental reasoning*.

Within the context of our journey together, the very process of evaluating the quality of student work in terms of some predetermined achievement standards, such as writing assessment, is a classic example of evaluative reasoning. When we express and defend a point of view or opinion, we reason in an evaluative manner. When we judge the quality of an assessment using our five keys to quality (see Figure 3.1), we reason in an evaluative manner.

Our instructional task is to help students understand the criteria they should be applying when they defend their point of view on an issue. Who is the best candidate for mayor? That's a matter of opinion. What are the important characteristics of a good mayor? As we discuss these criteria in class, we must address how to apply these standards logically.

Our assessment challenge is to determine if students are able to apply those criteria appropriately, given a novel evaluative challenge. Students who are able to appropriately evaluate a piece of writing they have never seen before using a learned set of analytical rating scales are demonstrating proficiency in evaluative reasoning. It is in this sense that I say this entire book is about developing critical thinkers.

Why These Patterns?

Three reasons. First, I sought to include what we normally think of as reasoning processes in the real world. The patterns needed to be practical. These patterns are simple and understandable, and at the same time describe what happens in the adult world beyond school.

Second, as I studied the professional literature, I found that classification systems abound for types of reasoning, but they tend to include many of the same patterns. So I gleaned from these various systems the things they had in common. The patterns described here have their foundation in current thinking about reasoning.

Third, I wanted patterns that I could describe and illustrate in terms that students (your students!) could máster. The fact that we can diagram each pattern and easily find examples makes them approachable by our students. That's a good thing.

But remember, after studying and reflecting on the reasoning targets that you want your students to master, you may find other classifications or definitions that work better for you. That's fine. Just be clear enough about your vision of excellence in reasoning that your definitions are practical, based on the best current understanding, and student friendly. Table 3.1. presents sample reasoning targets for Language Arts and Science.

Relationships Among Patterns

As I wrote about these patterns of reasoning and their classroom applications, I tried to use descriptive vocabulary so you could see key connections. I hope that your study of and reflection on the six organizing structures permitted you to notice the important connections among them. I list some here to establish the dynamic nature of reasoning. Your own reasoning may be different. If you are seeing rich relationships, you are reasoning productively.

- Reasoning is seeing relationships among things.
- Synthesis requires inductive inference; that is, we do it well when we can infer or see the unity arising from divergent parts.
- Complex comparisons require a prior step of analyzing the things to be compared to identify potential points of similarity and difference.
- Classification involves comparison of each item to be classified to the attributes of each category to infer which goes where.
- Inductive inference requires that we compare the pieces of evidence at hand to see what they have in common.
- Evaluation often requires analysis and comparison of different points of view before coming to judgment.
- Evaluative judgments about the quality of any reasoning can be made if we have standards for what it means to do it well.

Table 3.1
Reasoning learning targets in language arts and science

Pattern of Reasoning	Language Arts	Science
Analysis	Describe the process you used in writing your term paper.	Conduct an investigation to determine the active ingredient in an herbal medicine.
Synthesis	Write a fictional narrative.	Write a lab report.
Comparison	Identify similarities and differences between an Egyptian version of *Cinderella* and a Chinese version.	Make a chart showing ways in which the natural environment and the constructed environment differ.
Classification	Given a selection of words, sort them into categories representing parts of speech.	Sort and order objects by hardness.
Inductive and Deductive Inference	Inference: What does this story suggest about _____?	Inference: Draw a conclusion based on inquiry.
	Inductive inference: Now that you have read this story, what do you think is its general theme or message?	Inductive inference: Plot the locations of volcanoes and earthquakes to make a generalization about plate motions.
	Deductive inference: Given what you know about the role of a tragic hero in classic literature, if *this* character is a tragic hero, what do you think will happen next?	Deductive inference: Use characteristic properties of liquids to distinguish one substance from another.
Evaluation	Evaluate accuracy of information from a variety of sources.	Evaluate conclusions drawn from an experiment for legitimacy.

Source: From *Classroom Assessment for Student Learning: Doing It Right—Using It Well* (p. 70), by R. J. Stiggins, J. A. Arter, J. Chappuis, and S. Chappuis, 2004, Portland, OR: Assessment Training Institute. Copyright 2006, 2004 by Educational Testing Services. Reprinted by permission of Educational Testing Services, the copyright owner.

So it is that different ways of reasoning form a puzzle whose pieces can fit together in various ways to permit you and your students to figure things out. It is appropriate to help students see and understand the different organizing structures.

Students who encounter a new math problem, debate a volatile social issue, or confront an unknown substance in a science lab bring all of these ways of reasoning into play in a rapid-fire manner, analyzing the problem to infer what knowledge bases they must bring to bear. Beyond school, when students are confronted with a drug pusher, make career choices, or deal with the demands of peer pressure, they must think clearly and select a proper course of action. Those who are masters of their own reasoning and who know how to use their

minds effectively have a strong chance of generating productive responses to such circumstances.

Time for Reflection

Identify at least five reasoning or problem-solving achievement targets that might be relevant for students to master at the grade levels and in the subjects you teach or plan to teach.

Relationship to Other Targets

We can use our reasoning powers to generate new knowledge and understanding. When I combine two things that I knew before to derive an insight that I hadn't realized before, that insight can remain with me for future use. Further, my reasoning powers will come into play as I strive for skillful performance or product development—the next two kinds of targets. You'll see how as you read on.

Performance Skill Targets

In most classrooms, there are things teachers want their students to *be able to do,* instances for which the measure of attainment is students' ability to demonstrate that they can perform or behave in a certain way. For example, at the primary-grade level, a teacher might look for certain fundamental social interaction behaviors or oral reading fluency skills. At the elementary level, a teacher might observe student performance in cooperative group activities. In middle school or junior high, manipulation of a science lab apparatus might be important. And at the high school level, public speaking or the ability to converse in a second language might be a valued outcome.

In all of these cases, success lies in "actually *doing* it well." The assessment challenge lies in being able to define in clear terms, using words, examples, or both, what it *means* to do it well—to read or speak fluently, work productively as a team member, or carry out the steps in a lab experiment. To assess well, we must provide opportunities for students to show their skills, so we can observe and evaluate while they are performing.

Time for Reflection

Identify at least three achievement targets that take the form of performance skills that might be relevant for students to master at the grade levels and in the subjects you teach or plan to teach.

Relationship to Other Targets

To perform skillfully, one must possess the fundamental procedural knowledge and reasoning proficiency needed to figure out what skills are required. Further, skillful performance must combine with this knowledge and reasoning proficiency to create quality products (discussed in the next section). In this way, performance

skills represent an end in and of themselves as well as a building block for other competencies. For example, I cannot produce a quality piece of writing (a product) unless I have handwriting or computer keyboarding proficiency (performance skills) *and* the ability to think about the topic in ways that permit me to write fluently and coherently. I cannot deliver an effective spontaneous speech (skill) unless I know something about the subject and can figure out what needs to be said about that topic at this moment. It is critical that we understand that, in this category, the student's performance objective is to integrate knowledge and reasoning proficiencies and to be skillful. This is precisely why achievement-related skills often represent complex targets requiring sophisticated assessments. Success in creating products—the next kind of target—virtually always hinges on the ability to perform some kinds of skills. Performance skills underpin product development.

Product Development Targets

Yet another way for students to succeed academically in some contexts is by developing the capacity to create products that meet certain standards of quality. These represent tangible entities that are created by the performer, and that present evidence in their quality that the student has mastered basic knowledge, requisite reasoning and problem-solving proficiencies, and specific production skills.

For example, a high school social studies teacher might have students prepare a term paper to gather evidence of writing proficiency. A technology teacher might ask students to repair a computer to judge job-related preparedness. An elementary school teacher might challenge students to create a model or diorama. A primary-grade teacher might collect samples of student artwork.

In all cases, student success lies in creating products that possess certain key attributes when completed. The assessment challenge is to be able to define clearly and understandably, in writing and/or through example, what those attributes are. We must be able to specify exactly how high- and low-quality products differ and we must be prepared to express those differences in student-friendly language.

Time for Reflection

Identify at least two product development achievement targets that might be relevant for students to master at the grade levels and in the subjects you teach or plan to teach.

Relationship to Other Targets

Note once again that successful performance arises out of student mastery of prerequisite knowledge and through the application of appropriate reasoning strategies. In addition, students will probably need to perform certain predefined steps to create the desired product. Prerequisite achievement thus underpins the creation of quality products, but evidence of ultimate success resides in the product itself. Does it meet standards of quality?

Dispositional Targets

This final category of aspirations that we have for our students is quite broad and complex. It includes those characteristics that go beyond academic achievement into the realms of affective and personal feeling states, such as attitudes, sense of academic self-confidence, or interest in something that motivationally predisposes a person to act or not act.

Many teachers set as goals, for example, that students will develop positive academic self-concepts or positive attitudes toward school subjects predisposing them to strive for excellence. Without question, we want our students to develop strong interests, as well as a strong sense of internal control over their own academic well-being. We may define each disposition in terms of three essential elements:

- It is focused on some specific thing.
- It varies along a continuum from positive to negative.
- It varies in intensity from strong to weak.

Examples of things about which we might have attitudes (feelings) include ourselves as learners, school in general, specific subjects, classmates, and teachers. Those feelings about things are positive, neutral, or negative. For instance, our academic self-concepts are positive or negative. We might hold positive or negative attitudes about math or English. And sometimes those feelings are very strong, other times very weak—we range from passionate to disinterested. In school, we seek to impart strong positive dispositions toward learning new things, among other attitudes.

Positive learning experiences can result when teachers are in touch with students' dispositions (either as individuals or as a group) and when teachers can put students in touch with their own feelings about important issues. Obviously, however, we cannot know students' feelings about things unless we ask. This requires assessment.

Because these affective and social dimensions are quite complex, thoughtful assessment is essential. We define success in assessing them exactly as we do success in assessing achievement: Sound assessment requires a crystal-clear vision or understanding of the characteristic(s) to be assessed. Only then can we select a proper assessment method, devise a sampling procedure, and control sources of bias and distortion so as to accurately assess direction and intensity of feelings about specified objects.

Time for Reflection

Identify at least three dispositional targets that might be relevant for students to master at the grade levels and in the subjects you teach or plan to teach.

Summary of Targets

We have discussed four different but interrelated visions of achievement plus the affective component of student learning. Knowledge and understanding are important. Reasoning and problem solving require applying that knowledge. Knowledge and reasoning are required for successful skill performance and/or

- Master Content Knowledge
  - ✓ *Master* means know and understand
  - ✓ Content to know outright
  - ✓ Know where to find it
- Use Knowledge to Reason and Solve Problems
  - ✓ Analysis
  - ✓ Synthesis
  - ✓ Comparison
  - ✓ Classification
  - ✓ Inference
  - ✓ Evaluation
- Demonstrate Performance Skills
- Create Products
- Develop Attitudinal, Motivational Predispositions

Figure 3.9
An overview of kinds of achievement

product development. And dispositions very often result from success or lack of success in academic performance. But once again, remember that these can all grow and change in dynamic, interrelated ways within students. Figure 3.9 summarizes the kinds of targets we have discussed, and Table 3.2 presents sample achievement targets from various academic disciplines. Read down each column.

Time for Reflection

Let's say we wanted to extend Table 3.2 to include three more columns. Identify examples of knowledge, reasoning, skill, product, and dispositional targets that would be relevant for Foreign Language (spoken and written, separately) and for Social Studies.

A critical step in planning instruction or designing classroom assessments is to specify the type(s) of target(s) students are to hit. As you will see later, once a target is defined, the process of designing assessments is quite easy. The toughest part by far is coming up with the clear and complete vision!

The Critical Standards–Classroom Targets Connection

As noted earlier, our emergence into the era of standards-driven schools has spurred a great deal of high-powered reexamination of important achievement expectations. This is a boon to teachers because in virtually every field, we have at our disposal today definitions of academic competence that hold the promise of allowing us to produce better achievers faster than ever before. This applies to

Table 3.2
Sample achievement targets across school subjects

Achievement Target	Reading	Writing	Music	Science	Math
Knowledge and Understanding	Sight vocabulary Background knowledge required by text	Vocabulary needed to communicate Mechanics of usage Knowledge of topic	Instrument mechanics Musical notation	Science facts and concepts	Number meaning Math facts Numeration systems Algorithms
Reasoning	Decode the text and comprehend the meaning	Choose words and syntactic elements to convey message Evaluate text quality	Evaluate tonal quality	Hypotheses testing Classifying species	Formulate math problem from situation
Performance Skills	Oral reading fluency	Letter formation Keyboarding skills	Instrument fingering Breath control	Manipulate lab apparatus correctly	Use manipulatives while solving problem
Products	Diagram revealing comprehension	Samples of original text	Original composition written in musical notation	Written lab report Science fair model	Well-reasoned problem solution
Dispositions	"I like to read."	"I can write well."	"Music is important to me."	"Science is worth understanding."	"Math is useful in real life."

reading, writing, science, math, reasoning and problem solving, foreign languages, and many other subjects. Virtually every state and lots of local districts have standards of academic excellence, typically developed by teams of experienced teachers from within the state. In addition, states administer statewide assessments reflective of those standards, and schools are held accountable for demonstrating student mastery of state standards by scoring high on those tests. Success in reaching these standards turns, at least in part, on two actions we teachers can take on behalf of student learning: deconstructing each standard into the scaffolding students will climb as they aspire to success, and transforming those classroom targets into student-friendly versions.

Deconstructing Standards

Upon investigation, you will find that standards developed in these contexts typically are articulated in the form of relative large or global learning outcomes. Examples appeared earlier in Figure 3.3, one in history and the other in writing. A critically important step in laying the foundation for quality classroom assessments is the transformation of state or district standards into the classroom-level achievement targets that your students can acquire over time as they climb the scaffolding to a place where they are ready to demonstrate the required proficiency. To accomplish this, we must ask the following questions about each standard:

- What do students need to come to know and understand in order to be ready to demonstrate that they can meet this standard when the time comes to do so?
- What patterns of reasoning, if any, must they gain mastery of on their journey to this standard?
- What performance skills, if any, are called for as building blocks beneath this standard?
- What products must students become proficient at creating, if any, according to this standard?

I believe this deconstruction of our valued standards into the foundations of student success is best done at the school or district level to gain consistency in the faculty's vision of how to get students to competence. If that has not happened, then it becomes your responsibility to do it for your classroom.

Be advised that all standards arise from a foundation of knowledge. As the faculty, you and your colleagues must divide up responsibility for providing students with the opportunity to master it. Further, many standards expect mastery of specific reasoning patterns, while some also imply performance skill and product development capabilities. These must be identified and your collective instruction built around them. And, of course, these are proficiencies to be dependably assessed as students grow.

As a teacher, you may or may not practice in a district that engages in integrated planning. You may or may not practice in a school in which staff

collaborate in articulating achievement targets across grade levels or subjects. In short, you may or may not receive the kind of school and community support needed to do a thorough job of generating a continuous progress portrait of success for students.

Nevertheless, each of us has a responsibility to our particular students to be clear, specific, and correct about our achievement expectations. The point is, regardless of what is going on around you, tomorrow or as soon as you enter a classroom, a bunch of students will show up wanting and needing to master content knowledge, learn to solve problems, master important performance skills, learn to create important products, and/or develop certain dispositions. They count on you to know what these things mean and to know how to teach and assess them. When it comes to being clear about what it means to be successful in your classroom, the responsibility stops with you! Embrace this responsibility.

Student-Friendly Targets

You will recall that the Milwaukee, Wisconsin, team took the step of transforming their state standards into student- and community-friendly versions (see Figure 3.4), to be ready to show students from the very beginning of their work where the learning will take them. This team believes that students can hit any target they can see and that holds still for them.

This transformation to a student-friendly version is quite straightforward:

1. Identify the learning target: Let's say we want students to understand what it means to *summarize.*
2. Define the key term(s) in the simplest language: Start with the dictionary definition: "to give a brief statement of the main points, events, or ideas."
3. Rewrite that definition as an "I can" statement that the intended learner can understand: "I can summarize text. This means I can make a short statement of the main ideas."
4. Try it out on some students and adjust as needed to ensure understanding.

This can be a very productive way to introduce reasoning targets. For example:

1. *compare*
2. to cite similarities and differences
3. "I can compare things. This means I can tell how they are alike or different."

Or

1. *infer*
2. to draw conclusions from evidence
3. "I can make good inferences. This means I can use the information I have to make a good guess about something."

In fact, your students can be excellent partners, working with you to create ent-friendly versions of the targets you and they care about.

mmary: Clear Targets Are Essential Sound Assessment

his part of our journey into the realm of sroom assessment, I have argued that the ity of any assessment rests on the clarity of assessor's understanding of the achieve- t target(s) to be assessed. We strive for ent-valid assessments, and they start with r and appropriate targets.

We have identified four kinds of interre- l types of achievement expectations plus ct as useful in thinking about and planning ssessment and for integrating it into your uction:

- Mastering content knowledge (including understanding)
- Using that knowledge to reason and solve problems
- Demonstrating certain kinds of performance skills
- Creating certain kinds of products
- Developing certain dispositions

Each teacher faces the challenge of specify- desired targets in the classroom, relying a commitment to lifelong learning and ng strong professional preparation, com- ity input, and collegial teamwork within chool to support this effort.

When we are clear, benefits accrue for all ved. Limits of teacher accountability are olished, setting teachers up for time sav- and greater success. Limits of student untability are established, setting students or success. And, the huge assessment kload faced by teachers becomes more ageable.

We will make this clarity the second criterion by which to judge classroom assessment quality. High-quality assessments arise from easily identified and clearly articulated learning targets. They reflect the best current thinking in the field and are obviously important—that is, they deserve instructional and assessment time and effort. Poor-quality achievement targets, on the other hand, either (1) are missing, (2) are too broad or vague to guide assessment development, (3) fail to link to important academic standards, or (4) fail to reflect the wisdom of the field of study.

Thus, clarity and appropriateness will be the second entry in our set of comprehensive rubrics for judging classroom assessment quality (see Appendix B). You will have opportunities throughout your study to practice applying these standards of good practice.

I urge that you specify clear expectations in your classroom. Do so in writing and publish them for all to see. Eliminate the mystery surrounding the meaning of success in your classroom by letting your students see your vision. If they can see it, they can hit it. But if they cannot see it, their challenge turns into pin the tail on the donkey—blindfolded, of course. You will see in the next chapter how the target triggers key decisions about how to assess the achievement of your students.

Figure 3.10 presents the second entry in our set of rating scales for evaluating assessment quality (the complete set of rubrics appears in Appendix B). This entry asks, Does the assessment arise from and promise to accurately reflect clearly articulated achievement targets?

Still Needs Work	Well on Its Way	Ready to Use
The learning targets the assessment is to reflect are not stated and are not clear. There is no link established to relevant state or district standards. Targets do not reflect the best current thinking of the field. Standards have been improperly deconstructed into the scaffolding students will climb to achieve them. Targets have not been transformed into student-friendly language.	Learning targets are stated but they leave lots of room for interpretation; as a result there may be some disagreement or confusion among teachers as to their meaning. Some learning targets link to relevent standards, while others do not. Scaffolding is incomplete or vague in certain instances. Some accommodation to student understanding has been attempted.	Targets are stated and clear; all will interpret them to mean the same thing. They are clearly linked to relevant and important standards. They reflect the best current thinking of the field of study. Scaffolding is clear and complete. Student-friendly versions have been prepared.

Figure 3.10
Guide for evaluating assessments for clear targets

Final Chapter Reflection

1. *What are the three most important new insights to come to you as a result of your study of this chapter?*
3. *Which of your previous questions about assessment can you now answer based on your study of this chapter?*
3. *What new questions have come to mind as a result of your study of this chapter that you hope to have answered as your study continues?*

Practice with Chapter 3 Ideas

1. Engage your professor in a discussion of the intended standards and achievement targets of the course in which you are using this text. How do those expectations relate to the attributes and types of targets discussed in this chapter?
2. Here are several state standards. Deconstruct each into the enabling classroom-level knowledge, reasoning, performance skill, or product achievement targets (as appropriate) that underpin it.

   Reading—The student understands the meaning of what is read. Specifically, the student comprehends important ideas and details.

   Writing—The student writes effectively. Specifically, the student uses style appropriate to the audience and

purpose; uses voice, word choice, and sentence fluency for intended style and audience.

Mathematics—The student uses mathematical reasoning. Specifically, the student analyzes information from a variety of resources; uses models, known facts, patterns, and relationships to validate thinking.

Science—The student understands and uses scientific concepts and principles. Specifically, the student recognizes the components, structures, and organization of systems and the interaction within and among them.

Geography—The student understands the complex physical and human characteristics of places and regions. Specifically, the student identifies the characteristics that define the regions within which she or he lives.

Civics—The student analyzes the purposes and organization of governments and laws. Specifically, the student compares and contrasts democracies with other forms of government.

3. Select three state achievement standards from a state in which you may teach—any grade level or content area—and analyze them in terms of the foundations of classroom targets that students must master on their journey up to each of those standards.
4. Transform each of the following classroom learning targets into student-friendly versions:
   - The student will be able to reason analytically.
   - The student will be able to synthesize information.
   - The student will be able to classify things.
   - The student will be able to carry out evaluative reasoning.
   - The student will be able to reason inductively.
   - The student will be able to reason deductively.

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- assess and apply your understanding of chapter content with multiple-choice questions and essay questions,
- practice your skills with student activities, and
- broaden your knowledge of related issues with Web links to topics on the Internet.