she is not only thinking but totally lost in thought. Here is what is taking place in her mind:

> So much work to do today . . . must remember to meet Jim at 6 P.M. . . . I'll have to begin my term paper soon . . . That Bertha is such a slob—I wish she'd clean her part of the room sometime this semester . . . my hair looks so awful—if only I could fix it like Martha's, it would look neat, yet demand little attention . . . If winter would only end, I wouldn't be so depressed—why is my mood so dominated by the weather? . . . This coffee is bitter—you'd think the staff here could at least make a decent cup of coffee . . . I can't wait to get home to have a real meal again . . . wonder how much weight I've gained; perhaps jogging is the solution. . . .

Agatha's mental behavior is much closer to thinking than Claude's. Ideas, images, and notions are drifting through her mind, and she is dutifully watching them float by. But her role is passive; she is a spectator to the activity of her mind. Thinking, as we will view in this book (and as most authorities view it), is something more than aimless daydreaming.

WHAT IS THINKING?

What, then, is thinking? To begin with, it is purposeful mental activity over which we exercise some control. *Control* is the key word. Just as sitting in the driver's seat of a car becomes driving only when we take the steering wheel in hand and control the car's movement, so our mind's movements become thinking only when we direct them.

There are, of course, as many different purposes in thinking as there are in traveling. We may be on a business trip or a pleasant drive through the countryside with no particular destination. Similarly, we may drive in varying conditions and with varying degrees of success or efficiency. We may travel in darkness or in light, proceed slowly or quickly, take the correct turn or the wrong one, arrive at our intended destination or a different one, or find that we are hopelessly lost *en route*. Nevertheless, as long as we are steering our mind, we are thinking.

This does not mean that thinking must always be conscious. The evidence that the unconscious mind can join in purposeful mental activity is overwhelming. The most dramatic example is the fact that insights often come to us when we are no longer working on a problem but have turned away from it to other activities. (We will see a number of examples of this phenomenon in Chapter 9.)

With these important considerations in mind, we can attempt a more formal definition of thinking: *Thinking is any mental activity that helps formulate or solve a problem, make a decision, or fulfill a desire to understand. It is a searching for answers, a reaching for meaning.* Numerous mental activities are included in the thinking process. Careful observation, remembering, wondering, imagining, inquiring, interpreting, evaluating, and judging are among the most important ones. Often, several of these activities work in combination, as when

we solve a problem or make a decision. We may, for example, identify an idea or dilemma, then deal with it—say, by questioning, interpreting, and analyzing—and finally reach a conclusion or decision.

There have been many attempts to explain the nature of thinking. One of the most popular notions, now largely discredited, is that thinking is entirely verbal. According to this theory, we arrange words in our minds or silently whisper to ourselves when we think. Yet if this were the case, Albert Einstein would not be considered a thinker. His thinking consisted more of images than of words.[1] Contemporary authorities agree that the form a thought takes in our minds is usually verbal, but not necessarily so. Just as we may *express* an idea in mathematical symbols or pictures, in addition to words, we may also *conceive* of it in that way.

THE IMPORTANCE OF THINKING

Successful problem solving and issue analysis require factual knowledge—that is, familiarity with the historical context of the problem or issue and an understanding of the relevant principles and concepts. But factual knowledge is something already known, whereas in the great majority of cases, solutions are unknown, brand new, and specifically formulated to fit particular problems or issues. For this reason, the possession of factual knowledge does not by itself guarantee success in problem solving. You may, in fact, be the proverbial "walking encyclopedia" and perform quite dismally. To be a successful problem solver, you will need both factual knowledge and proficiency in thinking.

To appreciate the importance of thinking proficiency, consider the various situations in which you are or will be called upon to solve problems, analyze issues, and make decisions. The choice of a major in college and the decision of whom to marry, where to live, what religion (if any) to embrace, and what political party (if any) to join are but a few of the most obvious situations. Every day brings new and difficult challenges: how to deal with difficult people, what to do when your parents can no longer care for themselves, how to be a good parent, how to sort through hyperbole and false claims in advertisements, how to manage your investments wisely, how to determine which political candidate will do the most good (or the least harm) for the country.

Skill in problem solving, issue analysis, and decision making is increasingly expected of employees. Only a generation or so ago, "scientific management" was still in vogue. In that system, executives did the thinking and other employees merely carried out their assigned tasks. Since the advent of "quality management," employers have learned to value employees who are willing and able to contribute ideas for the improvement of the company. In recent years, this perspective has been reinforced by three developments: the knowledge explosion, the communications technology revolution, and the rise of the global economy.

Improvements in research capability have dramatically increased the information base in virtually every field, making it difficult for anyone to master even a single discipline's knowledge in its entirety. In addition, because new knowledge

is not merely being added each year but *multiplied*, before long such mastery will be impossible. More important, the information base acquired in high school and college, which used to be sufficient for an entire career, will in the future become obsolete within a decade or less.

The communications technology revolution has been even more remarkable. Within less than 20 years, the personal computer was developed and hundreds of hardware and software manufacturers sprang into existence, marketing products no one could have imagined a generation earlier. Hundreds of billions of dollars flowed into upstart companies like Microsoft, Intel, Dell, and a host of "dot-coms," ending the seeming omnipotence (and complacency) of such corporate giants as IBM. For individual companies and entire industries, the result has been a loss of stability. Even successful, well-run organizations can experience a rapid change of fortune and be forced to downsize their operations and lay off workers. Individuals who possess problem-solving and decision-making skills are more flexible than others and are therefore less likely to become victims of downsizing and more likely to find satisfactory employment if they are laid off.

The development of a global economy has resulted from the satellite transmission of television programming, the opening of former Soviet bloc countries to trade, the increase in business *competition* from other countries, and the signing of a new generation of trade agreements such as the North American Free Trade Agreement (NAFTA) and the General Agreement on Tariffs and Trade (GATT). Meeting the challenges and seizing the opportunities presented by the global economy require skill in creative and critical thinking. Employees who possess those skills will enjoy a significant advantage over those who do not.

BRAIN AND MIND AT WORK

For well over a century, researchers have deepened our understanding of human thought. We now know that thinking is not a mystical activity, unknowable and unlearnable. Thinking occurs in patterns that we can study and compare to determine their relative objectivity, validity, and effectiveness. This knowledge can be used to reinforce good thinking habits and to overcome bad ones. As James Mursell has observed, "Any notion that better thinking is intrinsically unlearnable and unteachable is nothing but a lazy fallacy, entertained only by those who have never taken the trouble to consider just how a practical job of thinking is really done."[2]

Brain research is providing new insights, notably that the structure of the brain is considerably more complex than previously imagined. The first breakthrough in understanding came when a neurosurgeon began treating patients with severe epilepsy in a new way. He severed the *corpus callosum*, the nerve fibers connecting the two hemispheres of the cerebral cortex, to relieve the symptoms of the disease. The separation made it possible to study the way each hemisphere functioned. The right hemisphere, it was learned, governs nonverbal, symbolic, and intuitive responses. The left hemisphere governs the use of language, logical reasoning, analysis, and the performance of sequential tasks.

Some popularizers of this research have taken it to mean there are "left-brained people" and "right-brained people," and a cottage industry has arisen to help people identify which they are and/or become what they are not. Most researchers regard this development as, at best, an oversimplification of the data. For example, Jerre Levy points out that none of the data "supports the idea that normal people function like split-brain patients, using only one hemisphere at a time," adding that the very structure of the brain implies profound integration of the two hemispheres, the *corpus callosum* connecting them and facilitating their arousal.[3]

William H. Calvin says that researchers who specialize in split-brain research (as he does) tend to regard the popularization "with something of the wariness which the astronomers reserve for astrology." He cites the "behavior and mental processes greater than and different from each region's contribution" as evidence of right/left integration.[4] Others underscore the fact that left-brain/right-brain research has been conducted with severely injured or surgically altered brains and not normal ones. In his Nobel lecture on the subject, for instance, Roger W. Sperry noted that "in the normal state the two hemispheres appear to work closely together as a unit, rather than one being turned on while the other idles."[5]

The extravagance of popularizers notwithstanding, neurophysiological research seems to parallel cognitive psychologists' earlier realization that the mind has two distinct phases—the *production* phase and the *judgment* phase—that complement each other during problem solving and decision making. Proficiency in thinking requires the mastery of all approaches appropriate to each phase and skill in moving back and forth between them. Let's examine each phase a little more closely, noting how good thinkers use each effectively.

The Production Phase

In this phase, which is most closely associated with creative thinking, the mind produces various conceptions of the problem or issue, various ways of dealing with it, and possible solutions or responses to it. Good thinkers produce both more ideas and better ideas than poor thinkers. They become more adept in using a variety of invention techniques, enabling them to discover ideas. More specifically, good thinkers tend to see the problem from many perspectives before choosing any one, to consider many different investigative approaches, and to produce many ideas before turning to judgment. In addition, they are more willing to take intellectual risks, to be adventurous and consider unusual ideas, and to use their imaginations.

In contrast, poor thinkers tend to see the problem from a limited number of perspectives (often just a single narrow one), to take the first approach that occurs to them, to judge each idea immediately, and to settle for only a few ideas. Moreover, they are overly cautious in their thinking, unconsciously making their ideas conform to the common, the familiar, and the expected.

The Judgment Phase

In this phase, which is most closely associated with critical thinking, the mind examines and evaluates what it has produced, makes its judgments, and, where appropriate, adds refinements. Good thinkers handle this phase with care. They

test their first impressions, make important distinctions, and base their conclusions on evidence rather than their own feelings. Sensitive to their own limitations and predispositions, they double-check the logic of their thinking and the workability of their solutions, identifying imperfections and complications, anticipating negative responses, and generally refining their ideas.

In contrast, poor thinkers judge too quickly and uncritically, ignoring the need for evidence and letting their feelings shape their conclusions. Blind to their limitations and predispositions, poor thinkers trust their judgment implicitly, ignoring the possibility of flaws in their thinking.

GOOD THINKING IS A HABIT

It is frequently said that good thinkers are born, not made. Although there is an element of truth in this, the idea is essentially false. Some people have more talent for thinking than others, and some learn more quickly. As a result, over the years one person may develop thinking ability to a greater extent than another. Nevertheless, effective thinking is mostly a matter of habit. Research proves that the qualities of mind required to think well, the qualities we noted in our discussion of the production and judgment phases, can be mastered by anyone. It even proves that originality can be learned. Most important, it proves that you don't need a high IQ to be a good thinker.[6] E. Paul Torrance has shown that fully *70 percent* of all creative people score below 135 on IQ tests.[7]

The difficulty of improving your thinking depends on the habits and attitudes you have. Chances are you've had little or no direct training in the art of thinking before now, so you're bound to have acquired some bad habits and attitudes. This book will supply principles and techniques for you to master, and your instructor will supply the guidance. You must supply the most important ingredients: the desire to improve and the willingness to apply what you learn.

If at first the task of changing your habits and attitudes seems impossible, remember that a lot of other tasks seemed so, yet you mastered them: walking, for example, and eating without drooling food out of your mouth onto your high chair, swimming, hitting a baseball, and driving a car. The unfamiliar often seems daunting.

THE STRUCTURE OF THIS BOOK

Becoming familiar with the contents of this book will help you meet its challenge more confidently. The purpose of the book is to *teach you how to think* more creatively and critically. That may seem obvious enough, but it's easily confused with *telling you what to think*. The difference is this: telling you what to think makes you dependent on other people's ideas; teaching you how to think liberates you from dependency on others' ideas and helps you form sound and sensible ideas of your own. You will find this book introducing you to, or deepening your acquaintance with, a host of problems and controversial issues. It will guide

the way you consider them—that is, the strategies you apply and the manner in which you apply them. But you will not find this book making up your mind for you. That task is yours alone.

The Art of Thinking is divided into four parts, each with several chapters. "Be Aware" will help you to broaden your outlook and become a critical reader. "Be Creative" and "Be Critical" will demonstrate ways to produce and evaluate ideas more effectively. "Communicate Your Ideas" will help you present your ideas more persuasively to other people.

Don't feel bound by the sequence of the chapters. If you haven't examined the table of contents closely, take a moment and do so now. Whenever you are interested in learning about a topic that appears in a later chapter, read ahead. For example, if you lack confidence in your writing, consult Chapters 14 and 15 now, and apply the advice presented there.

GETTING THE MOST FROM YOUR EFFORTS

At one time it was thought that the same occasions, places, and conditions of work are right for everyone. Today we know better. No two people are exactly alike in their needs. What works for one will not necessarily work for another. Mozart and Beethoven, for example, were both great composers, yet they worked very differently. Mozart thought out entire symphonies and scenes from operas in his head, without benefit of notes. Later he transcribed them onto paper. Beethoven, on the other hand, wrote fragmentary notes in notebooks, often reworking and polishing them for years. His first ideas were so clumsy that scholars marvel at how he could have developed such great music from them.[8]

Imagine what would have happened if Mozart had followed Beethoven's approach, and vice versa. Surely Mozart's output would have been diminished. Given the unsuitability of another approach to his temperament, it might even have been choked off altogether. And Beethoven would have given the world trash.

It is not unreasonable to believe that there are thousands, perhaps millions, of people in the world today who have not begun to glimpse, let alone develop, their potential for achievement *simply because they are using work habits borrowed from someone else or fallen into by chance or force of circumstance.* Your best approach is not to assume that your work habits fit your needs but to experiment a little and find out what really works best for you. What you find may not make a dramatic difference, but even modest improvements in proficiency will continue to pay dividends over the years.

Consider Time. An hour of prime time will often get better results than two or three hours of the wrong time. When are you in the habit of doing your most important schoolwork? Early in the morning? Late at night? At midday? For the next week or two, try different times and note the effect on your work.

Consider Place. You can observe students studying in strange places: dormitory lounges, crowded cafeterias filled with people clanging and chattering, and snack bars (often next to a blaring jukebox). You've probably studied in some of

these places, too, at one time or another, and for no other reason than that you happened to be there at the time an assignment had to be done. But that is not a good reason. If you need quiet to work efficiently, you should seek a quiet place—if not a dormitory room, then an empty classroom, a park bench, or a parked car. Of course, if you find that a busy place actually stimulates your thinking, by all means work there.

Consider Conditions. Thinkers throughout history have occasionally needed some strange stimuli. Poet Friedrich von Schiller needed a desk filled with rotten apples. Novelist Marcel Proust needed a cork-lined workroom. Dr. Samuel Johnson demanded a purring cat, an orange peel, and a cup of tea. But you'd do well not to become dependent on gimmicks or bizarre conditions, if for no other reason than that they're hard to maintain. You're better off trying such approaches as taking a walk or a brisk jog across campus before beginning work or playing music while you work.

A word of caution is in order here. Don't confuse what you like with what works best for you. You may, for example, enjoy watching TV or listening to the stereo blare. But these might hinder more than help your efforts to think or write. Similarly, alcohol and drugs may make you feel good (temporarily, at least), but they are definitely counterproductive. Although the notion persists that such substances enhance creativity, researchers are almost unanimous in concluding that they have the reverse effect: They cloud and numb the mind.

USING FEELINGS TO ADVANTAGE

Feelings were greatly emphasized in the 1960s and early 1970s. "Do your own thing," "If it feels good, do it," and "Get in touch with your feelings" were the catchphrases of the time. In light of the neglect of feelings in previous decades, that emphasis was understandable, but it often took the form of a rejection of thought. The proper relationship of thoughts and feelings is harmonious, not mutually exclusive.

The contribution feelings can make to problem solving and decision making is immeasurable. Not only do feelings often yield the hunches, impressions, and intuitions that help to produce the answers we seek but they also, more importantly, provide the enthusiasm to undertake difficult challenges and persevere in them. Albert Einstein spent 7 years working out his theory of relativity; Thomas Edison spent 13 years perfecting the phonograph; Copernicus devoted more than 30 years to proving that the sun is the center of the solar system. And millions of men and women labor tirelessly to realize the most elusive of goals: victory over disease, poverty, ignorance, and inhumanity. Without deep and abiding feelings about the importance of their work, such people could not sustain their efforts.

The popular notion that only artists feel, whereas scientists and other practical people approach problems in computer-like fashion, has long been discredited by scholars.[9] Albert Einstein himself affirmed the role of intuition in science. "There is no logical way to the discovery of [complex scientific laws]," he explained. "There is only the way of intuition, which is helped by a feeling for the

order lying behind the appearance."[10] And Arthur Koestler, who studied the lives of innumerable great scientists, observed, "In the popular imagination [they] appear as sober ice-cold logicians, electronic brains mounted on dry sticks. But if one were shown an anthology of typical extracts from their letters and autobiographies with no names mentioned, and then asked to guess their profession, the likeliest answer would be: a bunch of poets or musicians of a rather romantically naive kind."[11]

Of course, not all feelings are good. Some direct us in ways good sense would not have us go. From time to time even the mildest individuals may feel like responding violently to people they don't like, experience a strong urge for sexual contact with those who don't share the sentiment, or be overtaken by the impulse to steal something. For this reason, wisdom demands that we refuse to surrender ourselves to our feelings but instead examine them dispassionately and separate the worthy from the unworthy.

As you proceed through this course, try to become more aware of your feelings. Accept the challenge of finding your best and noblest feelings and allowing them to motivate you.

LEARNING TO CONCENTRATE

Many people have the notion that concentration means a constant, unbroken line of thought. They imagine that scientists, writers, inventors, and philosophers start from point A and move smoothly to point B without distraction. That notion is incorrect. Concentration is not so much something done to *prevent* distraction and interruption as it is something done to *overcome* distraction and interruption when they occur. To concentrate means to return our attention to our purpose or problem whenever it wanders.[12]

Concentrating is much like steering a car. When experienced drivers steer, they don't lock their hands on the wheel in one fixed position; they turn it slightly to the right and to the left to keep the car on course. Even on a straight road, the car stays on course only a small percentage of the time. Drivers must make constant adjustments, many of them almost imperceptible. Experienced drivers are not more talented than inexperienced ones; they have simply learned to make subtle corrections at the right time.

Similarly, the secret of efficient thinkers is not that they experience fewer distractions, but that they have learned to deal with them more quickly and more effectively than inefficient thinkers do. There is no magic in what effective thinkers do. You can learn it as they did, by practicing.

COPING WITH FRUSTRATION

All thinkers have their share of frustration: confusion, mental blocks, false starts, and failures happen to everyone. Good thinkers, however, have learned strategies for dealing with their frustration, whereas poor thinkers merely lament it—thus allowing themselves to be defeated by it. One important study of students'

problem-solving processes revealed some interesting differences between good and poor problem solvers. Among them were the following:[13]

Good Problem Solvers	Poor Problem Solvers
Read a problem and decide how to begin attacking it.	Cannot settle on a way to begin.
Bring their knowledge to bear on a problem.	Convince themselves they lack sufficient knowledge (even when that is not the case).
Go about solving a problem systematically—for example, trying to simplify it, puzzling out key terms, or breaking the problem into subproblems.	Plunge in, jumping haphazardly from one part of the problem to another, trying to justify first impressions instead of testing them.
Tend to trust their reasoning and to have confidence in themselves.	Tend to distrust their reasoning and to lack confidence in themselves.
Maintain a critical attitude throughout the problem-solving process.	Lack a critical attitude and take too much for granted.

MAKING DISCUSSION MEANINGFUL[14]

At its best, discussion deepens understanding and promotes problem solving and decision making. At its worst, it frays nerves, creates animosity, and leaves important issues unresolved. Unfortunately, the most prominent models for discussion in contemporary culture—radio and TV talk shows—often produce the latter effects.

Many hosts demand that their guests answer complex questions with simple "yes" or "no" answers. If the guests respond that way, they are attacked for oversimplifying. If, instead, they try to offer a balanced answer, the host shouts, "You're not answering the question," and proceeds to answer it himself. Guests who agree with the host are treated warmly; others are dismissed as ignorant or dishonest. As often as not, when two guests are debating, each takes a turn interrupting while the other shouts, "Let me finish." Neither shows any desire to learn from the other. Typically, as the show draws to a close, the host thanks the participants for a "vigorous debate" and promises the audience more of the same next time.

Here are some simple guidelines for ensuring that the discussions you engage in—in the classroom, on the job, or at home—are more civil, meaningful, and productive than what you see on TV. By following these guidelines, you will set a good example for the people around you.