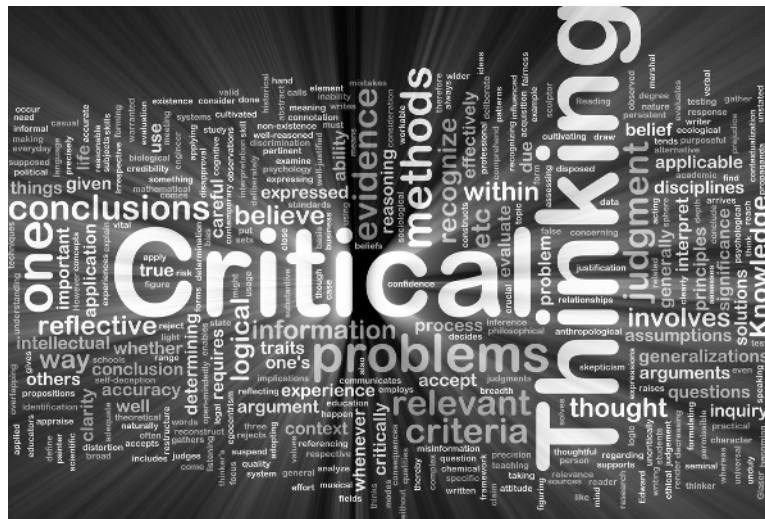# Part One

Introducing Critical and Creative Thinking

1

Essential Critical Thinking Concepts

Figure 1.1   Critical thinking. © Keng Guan Toh/Shutterstock

No problem can withstand the assault of sustained thinking.

—Voltaire

Introducing Critical and Creative Thinking

What Is Critical Thinking?

Critical thinking is a type of thinking in which you reflect and analyze when making decisions and solving problems. Based on logic and careful reasoning, critical thinking is purposeful thinking guided by reasoned evidence. It defines problems, identifies competing arguments, uses relevant data, raises key questions, and uses information effectively to make reasoned judgments. The word "critical" derives from the Greek work *kritikos*, which means "judge." Critical thinking involves rationality and convergent thinking.

Critical thinking does not necessarily involve criticizing ideas (although sometimes, being "critical" in this way can be an aspect of thinking critically). Nor is critical thinking used only for serious subjects or important issues. You can think critically about what kind of popcorn to buy or what hat to wear, whether to marry or remain single, whether you should go to graduate school or move to a foreign country.

Characteristics of critical thinking include noticing perceptively and establishing careful connections; asking probing questions and making meaningful distinctions. Critical thinking involves analyzing, interpreting, and evaluating evidence; applying knowledge; thinking independently and interdependently.

Certain tendencies, or dispositions, are essential for critical thinking. Among them are open-mindedness, honesty, and flexibility; perseverance; reasonableness, diligence, and focus. Critical thinkers reconsider ideas and sometimes change their minds. They recognize the legitimacy of alternative views, embrace ambiguity and remain open to continued learning.

Essential critical thinking competencies include evaluation and self-direction. Evaluation through informed and sound judgments, and through considering values, is central to the process of critical thinking. Self-direction includes self-awareness and self-regulation—managing your thinking and your motivation for thinking. Critical thinking also involves asking productive questions. Asking the right kinds of questions is as important as answering them. Essential significant questions include those shown in Table 1.1.

Essential Critical Thinking Concepts

Table 1.1   Essential critical thinking questions

What do you know?	What have you assumed?
What questions can you ask?	What does it mean?
What is the evidence?	What are the criteria?

Underlying these questions is the fundamental critical thinking question: "How do I know what I think I know?" And, "What evidence do I have for what I think I know?"

Critical thinkers constantly challenge their thinking and the thinking of others. They exhibit a stance of deliberate skepticism, refusing to accept assertions without evidence to support them. They also try to consider their own ideas from the perspective of others who might see things differently. The following questions, which have been adapted from Richard Paul's and Linda Elder's (2002) *Critical Thinking*, offer guidance in doing this.

Guiding questions for critical thinking

1. What are the purpose and goal of the thinking?
2. What question or problem is being addressed?
3. What is the point of view or perspective?
4. What claim or idea is being advanced, and why?
5. What facts, information, or data support the claim or idea?
6. What assumptions are being made, and which of those assumptions might be questioned or challenged?
7. What inferences are being made, and what conclusion is drawn from them?
8. What implications and consequences can be inferred?
9. What concept or theory guides the thinking?

Habits of Mind

Your intelligence is the sum of your habits of mind—how you use those mental habits to think and solve problems. This book is designed to improve your current productive habits of mind while helping you modify or eliminate bad thinking habits. The Institute for Habits of Mind identifies and recommends the following

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thinking habits: (1) applying past knowledge to new situations; (2) remaining open to continued learning; (3) posing questions and identifying problems; (4) taking intellectual risks; (5) developing and sustaining curiosity; (6) thinking independently and interdependently.

Applying past knowledge to new situations

Using what you already know, you make connections between prior knowledge and new situations. American philosopher John Dewey reminds us that we learn by reflecting on our experiences. Thomas Edison claimed that he never made mistakes, but rather kept learning what didn't work in the process of figuring out what might.

Remaining open to continued learning

You continue learning all your life, which involves identifying opportunities for continuous learning everywhere. Being "open" to learning opportunities includes being willing to consider other perspectives and ideas, to possibilities for intellectual growth and development wherever they can be found.

Posing questions and identifying problems

Asking productive questions and identifying problems are essential for quality thinking. Socrates asked probing questions, pushing those he questioned ever deeper into inquiry, often to the point of exasperation and an acknowledgment of their ignorance. Questions invite answers; considering answers to thoughtful questions helps you discover the limits of your knowledge.

Taking intellectual risks

Taking risks with your thinking, moving outside your comfort zone prods you to think in new and interesting ways. Taking risks involves the chance of failure; it involves being frustrated by uncertainty. Progress, however, depends upon taking chances. Being willing to fail, and even to embrace failure, is essential for invention and discovery.

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Developing and sustaining intellectual curiosity

Curiosity is the motivation for all learning. Children are immensely curious about all sorts of things. Many people, unfortunately, lose that curiosity during their years of schooling. One of the greatest thinkers of all time, Leonardo da Vinci, considered curiosity fundamental to his life as an artist, scientist, and inventor. He repeatedly acknowledged curiosity as his most important habit of mind.

Thinking independently and interdependently

Although necessary, independent thinking is only part of the story; also necessary is collaborative thinking. The process is reciprocal: you link your thinking with the thinking of others. You feed off the ideas of others, who then feed off yours. Both independent and interdependent thinking spur progress and spark innovation.

Why Intellectual Habits and Character Matter

To become truly useful, these habits of mind need to be actualized as things you do regularly. In making these kinds of thinking habitual, you develop what Ron Ritchhart (2004) has called "intellectual character," a cohesive way of thinking that is distinctively your own. His notion of intellectual character includes habits of mind, along with patterns of thinking and general dispositions about thinking that reflect how you think. Developing an intellectual character requires building on positive thinking dispositions, such as persistence, patience, and perseverance. Your intellectual character defines you as an individual thinker; it reflects your particular way of engaging the world mindfully.

David Brooks (2014) echoes and extends these ideas with a set of "mental virtues" he believes are embedded in character, virtues necessary for quality higher-order thinking. Among these mental virtues are intellectual courage, which Brooks defines as the "willingness to hold unpopular views." Firmness and autonomy require an ability to hold to your ideas in the face of opposition. They involve a balancing act between flaccidity and rigidity, and between respect for authority and tradition on one hand, and the ability to depart from those influences, on the other. Brooks adds generosity

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and humility to the mix, recognizing others' ideas and acknowledging the limits of your knowledge and understanding. Thinking well requires resisting vanity and laziness, pushing against the need for certainty, resisting the urge to avoid painful truths. In short, good critical thinking for Brooks is a "moral enterprise," one that requires "the ability to go against our lesser impulses for the sake of our higher ones."

Enhancing your ability to think critically can have a pronounced effect on your behavior as well as on your attitude toward learning and the thinking of others. Taking intellectual risks can make you both a more daring thinker and a more interesting one. Being open to the possibility of failure can lead you to a more experimental and exploratory frame of mind, permitting you to try different options with the knowledge that some won't work out. Risk-taking demonstrates a kind of intellectual courage necessary for eventual creative breakthroughs.

Learning to think interdependently enriches your intellectual experience, with opportunities for you to bounce ideas off others and to share in the pleasure of figuring things out together. It also provides practice in the necessary skill of collaboration, which is critically important in today's workplace. Being open to others' ideas and perspectives and willing to change your mind helps to develop skills in negotiation and conflict management, while enhancing your reputation as a reasonable and flexible thinker.

Overcoming Obstacles to Thinking

To develop productive intellectual habits, you need to overcome various obstacles that can block your thinking. In *Conceptual Blockbusting,* James L. Adams (2001) discusses blocks to thought, including perceptual blocks, cultural blocks, intellectual blocks, emotional blocks, and polarizing blocks.

Perceptual blocks to thinking

Perceptual blocks inhibit your ability to make sense of what you are looking at. They interfere with what you can see. To overcome perceptual blocks you keep looking until you can make sense of what you are seeing.

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In looking at Picasso's painting *Guernica*, for example, you notice distorted human figures. You can find Guernica on many Internet sites, including http://www.pablopicasso.org/guernica.jsp.

You see a horse with an open mouth, its tongue a spike, in what appears an agonized scream; you see an extended arm and a hand holding a light. You see distorted human arms and legs, hands and fingers and feet in contorted postures. You see a head thrown back with its mouth open, a person with arms extended upwards, and a hand clutching a sharp object.

Making sense begins with careful noticing. It involves relating the details you see, considering why they have been put together. It involves asking questions about what you observe. In the process you arrive at an understanding of the significance of what you are looking at.

Besides doing your own noticing, you can also ask colleagues or friends what they see and what sense they make of *Guernica*. You can also do some research into what Picasso attempted with this painting, and why he created it. Knowing something about the historical events that inspired Picasso to paint *Guernica* and learning something about the painting's varied contexts can deepen your understanding and enhance your appreciation.

Learning to see ably requires patience, effort, and practice. You prepare yourself to see; you learn how to look. One crucial element for improving your thinking, then, is to become more observant—to broaden and deepen your perception.

To notice the special features of Chartres cathedral, to appreciate the moves of basketball star LeBron James, or the skills of actors, such as Leonardo DiCaprio and Cate Blanchett, you have to know something about architecture, basketball, or acting, respectively. One pillar of observation is knowledge. The more you know about something, the better you see it, understand it, and appreciate it. You may take pride in your knowledge of architecture, basketball, movies and acting, a pride earned through a deepening of knowledge. That deepened knowledge enables you to see more and to see better than those who lack such knowledge. You can overcome perceptual blocks to thinking, then, in a variety of ways. Seeing more and seeing better, and knowing more are some productive perceptual blockbusting strategies.

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Cultural blocks to thinking

Cultural blocks develop from ingrained thinking habits. Cultural blocks to thinking derive from ethnic, racial, national, and intellectual traditions, as well as from your gender and social class. Italians and Norwegians, Latinos and Native Americans, Japanese and Singaporeans, men and women, the wealthy and the poor, bankers and poets, have different life priorities largely because of their different experiences and their differing social and cultural, political, and economic backgrounds. Similarly, people of different religions are committed to varied ideas about the role of children or animals in society, or the degree of respect given the elderly, or to educators, for that matter. Your perspectives on issues, including your way of seeing the world, are influenced by such factors.

Cultural blocks inhibit thinking. Recognizing cultural blocks is the first step toward avoiding them as an impediment to thinking. Being aware of your cultural filters enables you to better understand why you see the world as you do and why others may see it differently. It's a first step toward recognizing those other ways of seeing and acknowledging their legitimacy and value. This acknowledgment validates your own cultural background, perceptions, and filters, while also recognizing the legitimacy of other ways of seeing things, of other cultural perspectives.

Intellectual blocks to thinking

Intellectual blocks involve knowledge and its limitations. You may sometimes find yourself unable to solve a problem because you lack information or because the information you have is incomplete or incorrect. In buying a car, for example, you may not know the performance ratings of various models, or of their differing repair or safety records. You may have only information provided by dealers and their sales reps. If you lack a knowledge of cars, you will lack confidence when purchasing one.

On the other hand, you may know quite a bit about a particular subject yet lack the skill to express your ideas effectively. How often have you said to yourself, "I really knew what I wanted to say, but I just couldn't find the right words?" To break through an

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intellectual block, you need to acquire additional information or to deepen your understanding. You may have to think more deeply and more broadly about what you know—to consider other ways your knowledge can be applied or valued.

Emotional blocks to thinking

Emotional blocks to thought occur when feelings interfere with thinking. Emotional blocks include your fears and anxieties, with perhaps the biggest emotional block to thinking being the fear of being wrong. You may be concerned about how people perceive you, especially what they might think if you are mistaken. Consequently, you may be reluctant to advance ideas you are unsure of. "What if I'm wrong?" you might wonder. "What if people think my comment is stupid?" Such emotional blocks can inhibit your ability to explore ideas; they impede your thinking. The solution is to allow yourself the luxury of being wrong, to forgive yourself for your mistakes. Mistakes are necessary for intellectual development. Not always knowing the answers is normal; error can lead to discovery, as the history of science and technology repeatedly demonstrates. The invention of Kevlar, for example, which is used in bullet-proof vests, was developed after a serendipitous lab experiment that didn't work out; the failed experiment led to the discovery of a fiber that was five times stronger than steel and many times lighter, one that has saved thousands of lives. Such knowledge can alleviate your fears about being wrong and overcome emotional blocks to thinking.

Another emotional block to thinking is an inability to tolerate confusion, uncertainty, and ambiguity. Periods of uncertainty are often necessary for breakthroughs in thinking. A toleration of chaos in thinking, however temporary, can be critical. In writing a report, for example, you shouldn't expect to decide on your idea, plan the organization, and write the ideal version in a single attempt. Exploring a subject, entertaining ideas, experimenting with different organizational structures, and writing some messy drafts is common, even for professional writers. The esteemed American writer E. B. White took six drafts and 25 hours of work before he was satisfied with a single paragraph that he published about the moon landing in *The New Yorker* magazine in 1969. Few

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successful thinkers and writers get things just right the first time, even masters of their craft like E. B. White.

Polarizing blocks to thinking

To polarize is to see things as opposed—"polar opposites" we call them, such as "us" and "them," liberal and conservative, fashionable and unfashionable. Polarized thinking is "black and white" thinking, "either–or" thinking. Such thinking creates mutually exclusive categories that avoid compromise. Polarized categories, such as the following, inhibit thinking:

Yes/no	Friend/enemy
Win/lose	Diligent/lazy
Strong/weak	Intelligent/stupid

Avoid limiting your thinking with these and other polarized categories; seek instead, the middle ground between them. Think, for example, about being "for" or "against" some plan, project, or idea. Consider how such a limited forced choice often misrepresents the complexity of your feelings. You might create a continuum that permits gradations between the opposing perspectives. You may want to say, in such a case, "Hold on. I am for this part of the plan, but I'm against that part." You may favor curtailing health care costs, for example, but that does not necessarily mean that you support the President's latest plan for health care reform. Conversely, opposing the President's plan doesn't mean that you are against controlling the costs of health care. You may favor a particular economic stimulus package— just not the one that either Barack Obama or his opposition favors. Perhaps you support elements of each of their plans, but don't support either totally. "Yes but" and "No but" provide a structure for avoiding black-and-white, all-or-nothing polarized thinking.

Asking "to what extent" or "to what degree" is more productive than seeing a situation as "all or nothing." To avoid "black and white," "either–or" thinking, ask yourself the following question: "To what extent" is an idea acceptable, a book interesting, a film entertaining or provocative? Considering degree or extent pushes you to make distinctions, to explore and consider possibilities and

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Table 1.2 How to overcome obstacles to thinking

Obstacles to thinking	*Ways to overcome obstacles*
Perceptual blocks	Practice observing and noticing.
Cultural blocks	Become aware of cultural perspectives.
Intellectual blocks	Study. Review. Research.
Emotional blocks	Conquer fear of mistakes.
Polarizing blocks	Identify the middle ground.

shades of difference. It encourages listening to others' views and perspectives, thinking interdependently, and ultimately developing better critical thinking habits of mind (see Table 1.2).

A Model for Critical Thinking

In *Theory of Knowledge*, Richard van de Lagemaat (2006) presents a cyclical model for critical thinking: Question—Clarify—Support—Evaluate—Reflect. The model is cyclical, such that after the final stage reflection, the cycle begins again. According to this model, you begin with what you know—or think you know. And then you cycle through the following actions:

- ***You ask questions***: What questions can you ask about this knowledge?
- ***You seek clarification***: What does this knowledge mean for you?
- ***You consider available support***: What is the evidence for this knowledge?
- ***You evaluate***: What are the criteria by which you evaluate this knowledge?
- ***You reflect***: What have you assumed and what can you consider about this knowledge?

The circularity of the process suggests continuity; it never really ends. You continue to question and clarify, to seek evidentiary support. You keep on evaluating and reflecting on what you know. In the process, you deepen your understanding and extend your critical thinking capacities.

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How You Know What You Know

Underlying Richard van de Lagemaat's model of critical thinking—or indeed any model of thinking—lies a basic question: "How do you know what you know?" "Where does your knowledge come from?" Essentially, you learn things in three ways:

1. through your individual experience of the world;
2. through reading and hearing from others;
3. through figuring things out for yourself.

Experience, or empirical knowledge, comes through your senses—what you observe, feel, hear, smell, taste, and the like. Learning from others involves accepting authority, taking on faith what experts say about a subject. Figuring things out involves using your reasoning powers to understand and arrive at conclusions. Some philosophers posit a fourth way of knowing, a kind of intuitive understanding independent of experience. This kind of knowledge is somehow already there inside you; it is innate, or inborn; you simply have to discover it.

   Each of these ways of knowing, however, can lead you astray. Empirical knowledge cannot always be trusted, for sometimes you don't observe things accurately. Taking the word of others can also lead you into error when others are untruthful or mistaken. Using your reason can be problematic if you don't reason logically, or if you base your reasoning on false premises or erroneous information. And intuitive understanding might not be corroborated by empirical experience.

   Another challenge to knowledge concerns models of how the world works, because models are often vastly oversimplified when they are not simply wrong. As Nate Silver (2012) points out in *The Signal and the Noise*, inaccurate models magnify error because mistakes about complex systems are measured not by degrees or small margins of error, but by large orders of magnitude—the difference of a single zero between, say, 1,000,000 and 10,000,000, or the difference in a political forecasting error large enough to swing an election to one candidate rather than another. Perhaps the best known example of how small divergences in initial conditions can lead to divergent outcomes is the so-called

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"butterfly effect," in which it a massive storm on one conti-
nent can result from a distant butterfly flapping its wings on
another.

One complication with our knowing things is that particular
facts change over time. In *The Half-Life of Facts*, Samuel Arbesman
(2012) suggests that facts have "half-lives" in the same way ele-
ments do. He explains that we can understand the rates at which
facts are created and the rates at which they are disseminated.
Facts in the aggregate can be predicted in systematic ways. We
can classify the ways facts emerge and are replaced by other more
accurate facts. Some facts are in constant flux—the weather and
the stock market, for example. Others change exceedingly slowly—
the number of continents and oceans, for example. And then there
are facts whose rate of change is somewhere in between, "meso-
facts," as he calls them. Examples include the number of planets
in the solar system; the number of chemical elements in the peri-
odic table; the ways we store, process, and disseminate informa-
tion. Knowledge is not inert; it does not stand still. Changes in
our knowledge—in what and how we know—occur all the time in
large and small ways. This kind of knowledge variability is the rule
rather than the exception.

Perception and Knowledge

Perception is more complex than it typically appears. It involves
more than a simple kind of "seeing." Perception involves interpre-
tation, and hence understanding; it reflects what you think you
know and not just what you think you "see."

The art historian E. H. Gombrich (1960) has suggested that
we cannot separate "what we see from what we know." This is so
for three reasons. First, you can't know more than you can see.
That is, you can't understand something until you "see" it either
literally or figuratively (as when you "grasp" or "see" an idea). Sec-
ond, your ability to see (and understand) anything is grounded in
your prior experience. Your understanding is based on this prior
knowledge and on the expectations that derive from it. And third,
your knowledge and seeing are linked because they are based on
the conceptual categories you "think" with. You always see some-
thing "as" something that can be categorized, something that you

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know from experience or from general knowledge. The categories you use to see things enable you to see them yet, at the same time, limit your ability to see them in other ways, or to see other things. Categories work as perceptual filters that enable your seeing while, paradoxically, constraining it.

Seeing is also a kind of thinking, and "observation is also invention," as another art historian, Rudolf Arnheim (1969), has argued. When you see something, you make sense of it by making inferences about it, guessing what it is and adjusting those guesses to conform to your changing perceptions. Seeing, thus, is an active, selective, and interpretive process; it is not simply an automatic, objective absorbing of external reality.

How does this process of seeing work? When you see something, you begin "editing" it. Your brain highlights particular features of what you are looking at and suppresses others. Without the brain's editing of visual stimuli, you would not be able to make sense of what you see. By selecting, classifying, and relating details, your brain enables you to see something rather than a confused jumble. When viewing an object rooted in the ground, its trunk rising and proliferating in branches festooned with leaves, you see it "as" something—in this case as a deciduous tree. If your brain did not isolate particular features and highlight them, you would register, as American psychologist William James has noted, "a blooming, buzzing confusion."

Up till now, we have been emphasizing how we see via our sight. Perception, however, refers more broadly to an awareness of things through the other senses as well. Perceiving through your senses provides a knowledge and experience of the world and of others. Sight, for example, is essential in critical ways for scientific observation, for historical investigation, including eyewitness accounts, and for every aspect of architecture and the arts of painting, drawing, and sculpture, as well as for work in mathematics and music, language and literature—and much more. Hearing is essential for music, of course, and for theater, but it is also important for the study of literature—poetry especially—as well as for work in political science and rhetoric. Careful listening attunes us to nuances of meaning and implication, especially in social circumstances, especially when they involve unfamiliar cultural norms and values.

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Figure 1.2   Train in perspective. © Oleksiy Mark/Shutterstock

Perceptual illusions

One of the dangers of perception is that sometimes things you see appear different from the way they really are. Artists have long known how to make things appear "realistic"—the way they seem to us in everyday life—by using linear perspective. That's why the photograph of the train in Figure 1.2 seems right to us.

Look now at the three silhouette shapes in Figure 1.3. Things look a bit strange because the figures have not been scaled. The figures are actually the same size—though the one in the rear looks larger than those in the middle and in the foreground. Your eyes and brain tell you that the figures differ in size, but a measurement will confirm that all three are indeed the same size.

Figure ground and perception

In looking at objects, you focus on some aspects or details rather than on others—on the "figure" and not on the "ground." Reading these words, for example, you ignore the white background in favor of the black printed letters. You ignore, too, the spaces between the words—withoutthespacesthereitwouldbehardtoreadthewords.

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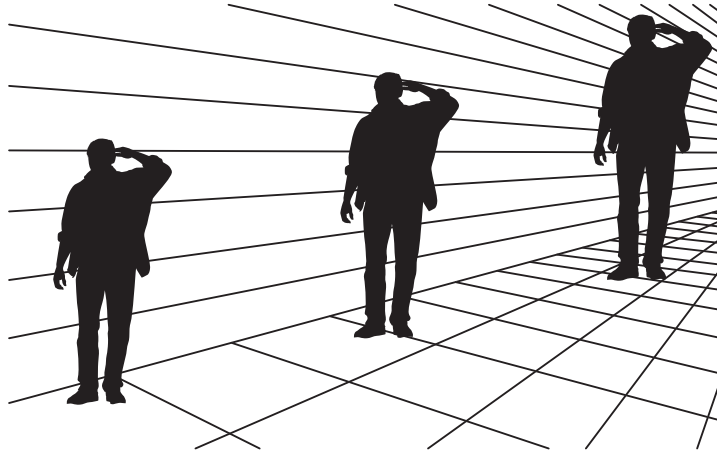
**Figure 1.3   Figures in perspective. © Darq/Shutterstock**

Some images can be confusing because they can be "read" in more than one way at the same time. Such figures or images are unstable and ambiguous. You can use figure and ground to look at the two images in Figures 1.4 (Goblet/faces) and 1.5 (Letter/number). In looking at Figure 1.4, focusing on the white part of the figure while keeping the black area as the (back)ground, you see two faces staring at each other. In switching the figure and ground, focusing now on the black figure with the white as background, you can see a goblet. In Figure 1.5, Letter/number, you can see either the letter B or the number 13. These unstable images, rife with visual ambiguity, suggest that things can be seen in more than one way–though not at the same time.

Perception and expectation

Expectations influence what and how you see. Read the following signs:

We go	Oh how
to	I love
Miami	Paris
in the	in the
the winter	the spring

Did you read "We go to Miami in the Winter" and "I Love Paris in the Spring"? Or did you read them as "We go to Miami in the
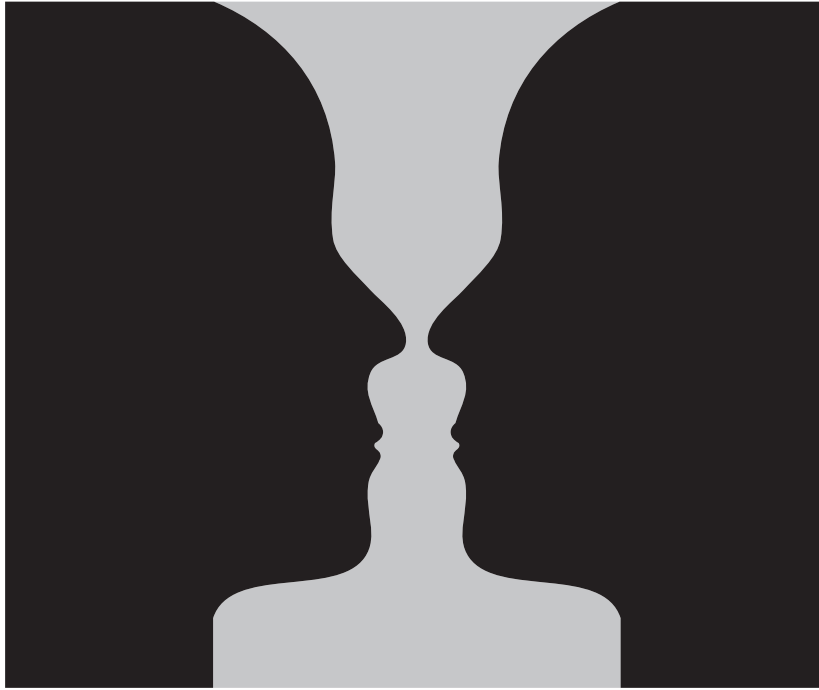
Figure 1.4   Goblet/faces. © astudio/Shutterstock

the Winter" and "Oh How I Love Paris in the the Spring"—which is what is actually written. Most people miss the second "the" in each case because that is not what they expected.

You see what you expect to see, and you don't see what may be in front of your nose if you did not expect to see it. In a striking set of psychological experiments, Christopher Chabris and

Figure 1.5   Letter/number

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Daniel Simons (2010) had participants watch a video showing two teams, one dressed in white, the other in black, as they bounced a ball back and forth. The participants counted the number of bounces made by the white-clothed players. During the experiment, a person dressed in a gorilla costume walked in front of the camera. In one experiment the "gorilla" went by quickly; in another, the "gorilla" stood for a few seconds before moving out of camera range. The psychologists asked the participants whether they saw anything unusual during their viewing of the video. Half saw only the teams bouncing basketballs, completely missing the "gorilla." It didn't matter whether the "gorilla" walked by quickly or paused briefly. Some participants, in fact, refused to believe that the "gorilla" was there at all—even after being confronted with the evidence on film. They simply did not believe they could have missed something so obvious. In fact, however, they didn't see it. You can find the original and subsequent examples of this selective attention test on YouTube.

Rolf Dobelli (2013) in *The Art of Thinking Clearly* calls his phenomenon "the illusion of attention." He suggests that we vastly overrate our ability to attend to things—especially when doing or seeing two or more things simultaneously. It is not so much that you miss every extraordinary event that streams past your visual plane. What you fail to notice remains unrecognized and unvalued. You may have no idea what you missed; you don't know what you don't know. This is dangerous because when you think you are perceiving everything of importance, you aren't. The reality may be distinctly otherwise.

Perception and culture

One additional filter of perception is culture. Your cultural background enables you to see things in certain ways. However, it also prevents you from seeing things in other ways. Or at least it makes it more difficult to see things from a different cultural perspective. That is one reason there is so much misunderstanding and conflict in the world. And it's one of the prime reasons a capacity to consider perspectives other than your own, other ways of seeing and understanding—other ways of describing "reality"—is so important.

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Roger von Oech (1986), who has written and consulted widely on thinking, tells a story about differing perceptions and understandings that result from differing cultural expectations. During World War II, American soldiers dated English women. Because of differing cultural expectations about dating, each accused the other of being sexually aggressive. The confusion resulted because of differently interpreted signals regarding kissing. According to American cultural norms of the time, kissing is about five on a sequence of thirty courtship steps leading to sexual intimacy. In the American sequence of events, kissing signals early romantic interest.

In pre-World War II England, however, kissing was more like step twenty-five of thirty. Kissing, from this perspective, was a much more serious event, and one that came considerably later in the courtship process. So when an American GI, dating an English woman decides, after a couple of dates, that it's time to kiss her to let her know he's interested, she is astounded. She thinks: "This isn't supposed to happen until much later." She might even feel cheated out of the remainder of the courtship rituals that, from her perspective, should have preceded the kissing. However, she must make a decision: either cut this relationship off, or get ready for intercourse, since, in her mind, it's only a few steps away. The American soldier, of course, is equally confused, since if the English woman backs off after the first kiss, he doesn't understand why. Conversely, if she turns on the heat, he wonders whether she's being overly aggressive. The result is culture shock for both of them.

Look at Figure 1.6 (Marine scene). What do you see? How do you think would someone from a culture with very different social values would describe what they see? Look again at the picture and consider how an American student and a Chinese student might describe it.

In an experiment in which they were asked to describe the picture, people of western backgrounds emphasized the fish swimming in the foreground. According to them, the picture was about the fish. People of Asian cultural backgrounds saw it somewhat differently. They placed more emphasis on the environment in which the fish were swimming. For them, it was less about the fish than about the relationship among all the elements of the environment, the fish being only one part. How people from these different

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Figure 1.6   Marine scene. © Audrey Armyagov/Shutterstock

cultural groups look at the picture—or, more precisely, what they see when they do—differs significantly.

What's interesting about this experiment is the ways it reflects how western cultures emphasize the individual, whereas Asian-Confucian cultures emphasize the group. For westerners individual will trumps the will of the group, for the most part. Of course, every individual has to negotiate his or her own self-expression and self-placement within a series of larger group contexts. But in the west, the development of individual talent takes precedence. Asian-Confucian countries tip the balance the other way, with subordination and restraint outshining boldness and assertiveness. An American proverb has it that "the squeaky wheel gets the oil"; in Japan, a proverb with the opposite implication carries more weight: "the nail standing up gets hammered down."

Cultural bias provides another related way that culture filters perceptions. If you prize your cultural heritage, you probably tend to see mostly the good in it while downplaying its less attractive features. You will likely be attentive to its achievements and contributions while ignoring its less savory aspects. Cultural biases include pride in your ancestry, your language, your country, geographical region, city or town, and neighborhood.

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Gender, race, and religion also serve as perceptual filters. What you see and understand is influenced by your experience as a male or female, as a member of a particular racial group, and by the beliefs you hold about the world. With such varied and powerful perceptual filters affecting what you see and think, you need to be alert to their shaping influence. In striving for the open-mindedness necessary for critical and creative thinking, you need to recognize the complexity of perception and its relation to knowledge and to other ways of thinking.

Being Wrong

In her book, *Being Wrong*, Kathryn Schulz (2011) identifies a number of reasons why we are often wrong, especially on occasions when we are convinced we are right. Primary among these is "error-blindness," which is, necessarily, invisible. Even though other factors contribute to error—arrogance, insecurity, stubbornness, and egocentrism, for example—blindness to false beliefs seems to trump them all. Part of the reason for the power of "error-blindness" is that we are not really able to feel that we are wrong, even when we are clearly in error. Since we can't see our mistakes, we conclude that we are right. Once we do see our mistakes, Schulz suggests, we consider them as our past mistakes—what we once thought or believed but which we no longer accept as true. Thus, they are no longer part of our perceptual apparatus, no longer part of what we believe.

She cites an example presented by Sigmund Freud in *The Psychopathology of Everyday Life*, a classic study of why people make mistakes. Freud describes a time when he could not recall the name of a patient he had treated, even though he had seen her for many weeks not long before his instance of forgetting. It turns out that Freud had misdiagnosed the patient as suffering from hysteria when in fact she was suffering from abdominal cancer, which soon killed her. Freud's lapse of memory was a direct consequence of his need to forget such a horrible outcome, for which he blamed himself. She also provides an example from her own life when she made a mistake in pronouncing the name of the German poet Goethe (GER-tah) and had to be corrected by a professor. Her mistake, though embarrassing, was something etched in her

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memory, unlike Freud's, which was something to suppress. And who knows more about suppression and repression than Sigmund Freud, who, ironically, did the very thing he identified as a general behavior of others?

Another series of explanations for error is offered in *Thinking, Fast and Slow*, in which Daniel Kahneman (2011) identifies numerous biases that skew thinking, arguing that we overestimate how much we understand about the world and, conversely, underestimate how little we actually know. He adds that our confidence, actually an over-confidence, is increased by what he calls "the illusory certainty of hindsight." We behave as if we know that we are right because we feel that we are, even when we are incontrovertibly wrong. This state of affairs he calls "theory-induced blindness," which is "an adherence to a belief about how the world works that prevents you from seeing how the world really works."

Thinking, in Daniel Kahneman's view, functions as two parallel mental systems. The first, which he calls "System I," operates quickly and automatically, even effortlessly. The second, "System II," involves effort and thought. System I thinking occurs fast without second thoughts. System II thinking takes time; it involves concentration, judgment, and analysis. You mostly operate with System I thinking habits in full force. That's the default. The ease of this kind of nearly effortless thinking is seductive; it involves the "blink" thinking in contrast to the cognitive strain and mental effort involved with "think," or deliberate thinking. "Just stop and think about it," you sometimes have to tell yourself (or someone else, when ready to make a decision). "Have you (or I) really thought this through"? In such instances, "System II" thinking is in effect. Both of these thinking systems are necessary. We need to understand the limitations of each and develop an awareness of when, where, and how to use thinking fast, and when, where, and how, to use thinking slow.

Daniel Kahneman uses the acronym WYSIATI to stand for "What You See Is All There Is." In believing WYSIATI, you are likely to make judgments and decisions on insufficient information, on a too-small sample, on inadequate evidence. The result, often, is a mistake. WYSIATI errors are related to overconfidence in a detected pattern, a pattern you believe to be of value and importance, one that explains things with predictive accuracy. However, WYSIATI understanding is less a matter of fact than

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a matter of faith. Faith in WYSIATI simply confirms your prior beliefs; it reinforces your hopes; it reflects a perceptual problem identified as confirmation bias, which involves looking for evidence that sanctions what you believe and ignoring evidence that contradicts that belief.

Why Errors Persist

In considering another kind of related error—the failure of predictions and forecasts—Nate Silver, in *The Signal and the Noise,* offers three common reasons for the their persistence. First, you focus on signals, on information and details that convey a story or embody a picture of the world less as it is, than as it is believed to be. Second, you exaggerate positive potential outcomes while wildly downplaying risks, all the while ignoring risks that are hardest to measure. Third, you make assumptions about "reality"—the world as it is—that are typically far rougher and cruder than what is really the case. Uncertainty and ambiguity are distasteful even when inescapable; they are an intractable part of understanding complex occurrences.

A different explanation for errors and mistaken understandings is provided by Satyajit Das in his essay, "Impossible Inexactness," where he argues that inexactness cannot be escaped; Das (2013) sees it as a "profound beauty [that] transects science, mathematics, method, philosophy, linguistics, and faith." He suggests that inexactness undermines certainty and scientific determinism. All knowledge of the world is inherently and inescapably inexact—incomplete, uncertain, and contingent.

Inexactness, moreover, constrains measurement and limits the usefulness of causal explanation. Experiments can only prove what they have been structured or designed to demonstrate—nothing more. Causal explanation, based on knowledge of the present and allowing for prediction of future consequences, is false because knowledge in and of the present is ineluctably inexact. Predictions about future results, thus, suffer from inevitable uncertainty.

Another consequence of error is that once we are shown false information, it is difficult to erase it from our minds. As Daniel Levitin (2014) explains in *The Organized Mind*, it is "difficult to hit the cognitive reset button." Erroneous information has staying

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power as original knowledge. That's why lawyers often plant the seed of false information in the minds of judges and jurors. They know that false information will persist in jurors' minds.

This phenomenon is especially strong with respect to faulty social information—malicious gossip, for example. Nicholas Epley (2014) in *Mindwise* argues that we remain unaware how our beliefs are formed, that we just don't know how we come to believe or think what we do. This "belief perseverance" makes it very hard to eradicate false accusations and assertions about others that we hear about. Those false notions insinuate themselves into our consciousness such that even when evidence is shown that discredits them, we persist in believing those first inaccurate errors.

Other problems leading to error include something that Samuel Arbesman (2012) in his *The Half-Life of Facts*, calls "change blindness." In this error syndrome, you simply filter out facts you find uncomfortable or inconvenient. One example is how old information sticks even when new information has clearly displaced it, a form of "factual inertia." In everyday life this kind of error behavior affects only individuals and mostly in small ways. However, when extended to more significant scenarios of scientific research, "change blindness" and "factual inertia" can have more serious consequences. The physicist Max Planck once remarked: "New scientific truth does not triumph by convincing its opponents and making them see the light, but rather because its opponents eventually die, and a new generation grows up that is familiar with it." Such is the human reality that accompanies scientific research and advancement.

As another example of how error can permeate scientific studies, Samuel Arbesman summarizes the work of a researcher, John Ioannidis, who has found that significant clinical trials of new medical procedures, which are initially found to have significant benefits, upon repeated study, are later discovered to have negligible effects and sometimes no beneficial effects at all. The outcome, essentially, of more testing is a better understanding such that we can trust less and less in what was initially found to be the case.

Arbesman summarizes the key points that Ioannidis makes about scientific studies:

1. The smaller the study, the less likely the research yields true results.

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2. The smaller the size of the effect, the more likely the findings are false.
3. The greater the number of tested relationships in experiments, the more likely that some results are due to chance.
4. The more flexibility in the design, definition, and outcome, the less likely the research findings can be replicated.
5. The greater the financial and other biases, the less likely the research yields accurate and useful results.
6. The hotter a scientific field, the less likely the research findings are to be true.

Errors abound, even when it looks like scientific studies are being done to show how something is the case, when on closer inspection, they prove that it is not. To sum up: error leads not away from the truth, but toward it incrementally, a little at a time.

Applications

1-1. Which of the traits of intellectual character described by Ron Ritchhart and David Brooks do you think are most important? Which, for you, are the most difficult intellectual traits to acquire and develop? Why?

1-2. Choose something to look at that has been difficult for you to really see. It could be a work of art, something in nature, a person, a place in your neighborhood, even a room or portion of a room in your home, school, or workplace. Make an effort to look really closely and patiently and to discover at least three elements you had not noticed or appreciated before.

1-3. Identify two cultural blocks to understanding and thought that, if removed, would promote tolerance, improve social relationships, or enhance one of the environments in which you live or work.

1-4. Describe a time when you were fearful of presenting an idea or of volunteering for a project. Looking back on it now, consider what you might have done to overcome or at least minimize your fear. Consider, too, why you may have experienced that fear—and the extent to which it was a legitimate fear.

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1-5. Choose one of the following sets of polarized terms. Draw a continuum, as shown in the example for love/hate. Identify 3 or 4 intermediate terms and place them on your continuum.
Example: Hatred … Love
Hatred Enmity Animosity Disaffection Indifference Affection Fondness Love
   Heroic … Cowardly
   Proud … Humble
   Speech … Silence
   Spiritual … Secular

1-6. Apply Richard van de Lagemaat's critical thinking cyclical process to a topic with which you are familiar but not an expert. Perform the tasks at each of the stages associated with his cycle of actions—to question, clarify, support, evaluate, and reflect.

1-7. Give an example of a time when you were in error because of sense experience, being misled by others, reasoning from false premises or erroneous information, or discovering that a self-evident truth you believed was contradicted by empirical knowledge.

1-8. Why do you think so many participants failed to see the "gorilla" in the experiment done by the psychologists Christopher Chabris and Daniel Simons? Do you think you would have seen it? How confident are you about that? Why?

1-9. How do you respond to the "kissing" scenario described by Roger von Oech? What do you think the woman should have done? Why? Was there a way for her to have avoided the possibility of misunderstanding?

1-10. Describe a time when one aspect of your cultural background and experience influenced, or perhaps even caused you to see, experience, and/or understand something very differently from someone else. What did you perceive? What did the other person perceive? How did the difference in perception affect your discussion or relationship?

1-11. Which of the following advertisement slogans do you think would appeal to Americans and which to Koreans? Why?
   1. Seven out of ten people are using this product.

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2. The Internet isn't for everybody. But then you are not everybody.

1-12. Select two of the following questions for reflection.

1. To what extent can we trust our perceptions? To what extent is perception a reliable source of knowledge?

2. How can we prepare ourselves to see things from the perspective of others? To what extent is this possible?

3. How does our description of what we see (or someone else's description of it) affect how we see it and respond to it?

4. How can we minimize the role our emotions play in perception? And should we try to do this?

1-13. Identify a current television comedy or movie you have seen that turns on some kind of error or mistake. Explain what is amusing about that error and what the actors and director make of it. To what extent do you agree with Kathryn Schulz that error can be useful, beneficial, and productive?

1-14. Why do you suppose that Freud could not remember his patient's name and that Schulz seems unable to forget her mistake about pronouncing the name of Goethe? To what extent do you think the forgetting and remembering are related to the seriousness of the incident?

1-15. What benefits can we take away from Daniel Kahneman's analysis of our propensity to overestimate our knowledge and our ability to predict what will happen in the future? How useful do you find his discussion of WYSIATI? Of his idea that we are "blind to our own blindness?"

1-16. What does Nate Silver add to your understanding of the challenges that confront us as we attempt to understand how things work in the world?

1-17. How do you respond to Samuel Arbesman's discussion of "factual inertia" and "change blindness" and to the idea that error leads us closer to truth?

1-18. How does the criminal justice system use epistemology in asking a jury to determine a defendant's guilt or innocence? What is the jury actually asked to do in a criminal trial? (That is, how does "doubt" factor into their decision? What place does "doubt" play in their verdict?)

1-19. In his *Theory of Knowledge*, Richard van de Lagemaat proposes that we think of belief and knowledge in terms of a

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continuum—a spectrum—that ranges from the impossible through the possible and on to the certain:

<->10	<->5	0	+5	+10
Impossible	Unlikely	Possible	Probable	Certain
		(*Belief*)		(*Knowledge*)

Put the following different beliefs on the continuum:
1. Eating six walnuts a day is good for your heart.
2. American astronauts planted the American flag on the moon.
3. Other universes exist; aliens exist in some of them.
4. There is life after death.

1-20. How do you respond to the suggestions about the persistence of erroneous thinking made by Daniel Levitin and Nicholas Epley? To what extent do you recognize in yourself a tendency to retain errors you received as original knowledge? What might you do to combat or otherwise compensate for this tendency?

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