CHAPTER 9

Thinking, Language, and Intelligence

Chapter Preview

Concepts, the building blocks of thinking, simplify the world by organizing it into a hierarchy of categories. Concepts are often formed around prototypes, or the best examples of a category.

When faced with a novel situation for which no well-learned response will do, we may use problem-solving strategies such as trial and error, algorithms, heuristics, and insight. Obstacles to successful problem solving include the confirmation bias, fixation, and a form of fixation called mental set. Heuristics provide efficient, but occasionally misleading, guides for making quick decisions. Overconfidence, belief perseverance, and framing further reveal our capacity for error. Still, human cognition is remarkably efficient and adaptive. For example, creative thinkers exhibit divergent thinking. And, with experience, our intuition becomes more efficient and adaptive, and we grow adept at making quick, shrewd judgments. Research has shown that other species share many cognitive abilities with humans.

Language facilitates and expresses our thoughts. Spoken language is built from phonemes, morphemes, words, and the semantics and syntax that make up grammar. The ease with which children master language suggests that they are biologically prepared to learn words and use grammar. Language processing illustrates how the mind's subsystems are localized in particular brain regions, yet the brain acts as a unified whole.

Thinking and language are difficult to separate. Although the linguistic determinism hypothesis states that language determines thought, we know that thinking can occur without language, and so we might better say that thinking affects our language, which then affects our thoughts.

Another debate concerns whether language is uniquely human; it has been fueled by studies of animals, particularly chimpanzees, who have developed considerable vocabularies and who can string words together to express meaning. Skeptics point out important differences between apes' and humans' abilities in the verbal or signed expression of complex grammar.

Today, intelligence is generally considered to be the ability to learn from experience, solve problems, and adapt to new situations. Psychologists debate whether intelligence is one general ability or several specific abilities. Some theorists have expanded the definition of intelligence to include social intelligence, especially emotional intelligence.

Barely a century ago, psychologists began designing tests to assess people's abilities. Some measured aptitude; others assessed achievement. In France Alfred Binet developed questions that helped predict children's future progress in the Paris school system. Lewis Terman of Stanford University used Binet's ideas to develop the Stanford-Binet intelligence test. German psychologist William Stern derived the formula for the famous intelligence quotient, or IQ.

Modern tests are widely accepted only if they are standardized, reliable, and valid. Aptitude tests tend to be highly reliable, but they are weak predictors of success in life. One way to test the validity of a test is to compare people who score at the two extremes of the normal curve: the challenged and the gifted.

Studies of twins, family members, and adopted children point to significant genetic determinants of intelligence test scores. These and other studies also indicate that environment significantly influences intelligence test scores. Psychologists debate evolutionary and cultural explanations of gender differences in aptitudes and abilities. Environmental differences are perhaps entirely responsible for racial gaps in intelligence.

Aptitude tests, which predict performance in a given situation, are necessarily "biased" in the sense that they are sensitive to performance differences caused by cultural experiences. However, the major tests are not biased in that they predict as accurately for one group as for another. Stereotype threat can adversely affect performance and sometimes appears in intelligence testing among African-Americans and women.

Chapter Guide

Introductory Exercise: Fact or Falsehood?

The correct answers to Handout 9–1 are as follows: 1. F 2. F 3. F 4. T 5. T 6. F 7. T 8. T 9. F 10. T

▶ Exercises: The Limits of Human Intuition (p. 495)
▶ Project: The Need for Cognition Scale (p. 495)

Thinking

9-1. *Define* cognition*, and describe the functions of concepts.*

Cognition refers to the mental activities associated with thinking, knowing, remembering, and communicating.

▶ Exercises: Cognitive Complexity (p. 496); Introducing Prototypes (p. 497)
▶ PsychSim 5: My Head Is Spinning (p. 497)

To think about the countless events, objects, and people in our world, we organize them into mental groupings called ***concepts***. Although we form some concepts by definition—for example, a triangle has three sides—more often we form a concept by developing a ***prototype,*** a mental image or best example of a particular category. For example, a robin more closely resembles our "bird" category than does a penguin. The more closely objects match our prototype of a concept, the more readily we recognize them as examples of a concept. Once we place an item in a category, our memory of it later moves in the direction of the category prototype.

▶ Exercises: Dice Games to Demonstrate Problem Solving (p. 498); The "Aha!" Experience (p. 499); Confirmation Bias (p. 502); Functional Fixedness: A Type of Fixation (p. 503); Mental Set and Luchin's Water Jug Problem (p. 504)
▶ Lectures: Jokes, Riddles, and Insight (p. 501); The Confirmation Bias and Social Judgments (p. 502)
▶ Projects: The Tower of Hanoi Problem (p. 497); Problem-Solving Strategies (p. 498)
▶ Exercise/Lecture Break: Experts Solving Problems (p. 501)

9-2. *Describe the cognitive strategies that assist our problem solving, and identify the obstacles that hinder it.*

We approach some problems through *trial and error,* attempting various solutions until stumbling upon one that works. For other problems, we may follow a methodical rule or step-by-step procedure called an ***algorithm***. Because algorithms can be laborious, we often rely instead on simple thinking strategies called ***heuristics***. Speedier than algorithms, heuristics are also more error-prone. Sometimes, however, we are unaware of using any problem-solving strategy; the answer just comes to us as a sudden flash of ***insight***. Researchers have identified brain activity associated with insight.

A major obstacle to problem solving is our eagerness to search for information that confirms our ideas, a phenomenon known as ***confirmation bias***. This can mean that once people form a wrong idea, they will not budge from their illogic.

Another obstacle to problem solving is ***fixation***—the inability to see a problem from a fresh perspective. The tendency to repeat solutions that have worked in the past is a type of fixation called ***mental set.*** It may interfere with our taking a fresh approach when faced with problems that demand an entirely new solution.

▶ Exercises: The Availability Heuristic (p. 504); The Representativeness Heuristic (p. 505); The Base-Rate Fallacy (p. 506); The Anchoring Heuristic or Bias (p. 507); The Overconfidence Phenomenon (p. 509); Framing Decisions (p. 509); Framing Alternatives and Human Irrationality (p. 510)

▶ Lectures: The Projective Way of Knowing (p. 507); The Sunk Cost Fallacy (p. 508); The Disjunction Fallacy or Irrational Prudence (p. 511); Thinking Errors and International Conflict (p. 512); Risks in Everyday Life (p. 512); Perceiving Risk and the Fear of Global Warming (p. 513)

9-3. *Explain what is meant by intuition, and describe how the availability heuristic, overconfidence, belief perseverance, and framing influence our decisions and judgments.*

Intuition is the effortless, immediate, automatic thinking we use constantly in making everyday decisions. The ***availability heuristic*** operates when we base our judgments on the availability of information in our memories. If instances of an event come to mind readily, perhaps because of their vividness, we presume such events are common. The availability heuristic enables us to make snap judgments. However, these quick decisions sometimes lead us to ignore important information or to underestimate the chances of something happening. We often fear the wrong things because we fear what our ancestral past has prepared us to fear, what we cannot control, what is immediate, and what is most readily available in memory.

Overconfidence, the tendency to overestimate the accuracy of our knowledge and judgments, can have adaptive value. People who err on the side of overconfidence live more happily, find it easier to make tough decisions, and seem more credible than those who lack self-confidence. At the same time, failing to appreciate one's potential for error when making military, economic, or political judgments can have devastating consequences.

We exhibit ***belief perseverance,*** clinging to our ideas in the face of contrary evidence, because the explanation we accepted as valid lingers in our minds. Once beliefs are formed and justified, it takes more compelling evidence to change them than it did to create them. The best remedy for this form of bias is to make a deliberate effort to consider evidence supporting the opposite position.

The same issue presented in two different but logically equivalent ways can elicit quite different answers. This ***framing*** effect suggests that our judgments and decisions may not be well reasoned, and that those who understand the power of framing can use it to influence important decisions—for example, by wording survey questions to support or reject a particular viewpoint.

▶ Exercises: The Limits of Human Intuition (p. 495); Differences in Thinking Styles (p. 514)

9-4. *Describe how smart thinkers use intuition.*

Although human intuition is sometimes perilous, it can be, whether conscious or unconscious, remarkably efficient and adaptive. Research shows that in making complex decisions, we benefit by letting our brain work on a problem without thinking about it. As we gain expertise in a field, we become better at making quick, adept judgments. Experienced nurses, firefighters, art critics, and hockey players learn to size up a situation in an eyeblink. Intuition is powerful, but sometimes perilous, and especially so when we overfeel and underthink, as we do when judging risks. So, we need to check our intuitions against reality.

▶ Lecture: Creative People—Ten Antithetical Traits (p. 560)
▶ Exercises: Assessing Creativity (p. 559); Coding Intelligent/Creative Behavior (p. 560)

9-5. *Define* creativity, *and describe how creativity is fostered.*

In general, ***creativity*** is supported by a certain level of *aptitude* (ability to learn), but creativity is more than school smarts and requires a different kind of thinking. Aptitude tests require ***convergent thinking*** (they require a single correct answer), while creativity involves ***divergent thinking*** that imagines multiple solutions to a problem (such as how many uses you can think of for a brick). Studies suggest five other components of creativity: expertise, imaginative thinking skills, a venturesome personality, intrinsic motivation, and a creative environment.

▶ Lecture: Do Animals Plan Ahead? (p. 514); Kanzi, a Remarkable Bonobo (p. 515)
▶ Worth Video Anthology: *Problem Solving in* Genus Corvus *(Crows, Ravens, and Magpies); How Intelligent Are Animals?; Can Chimpanzees Plan Ahead?*

9-6. *Describe what is known about animal thinking*.

Animals, especially the great apes, show remarkable capacities for thinking. Sheep can recognize and remember individual faces, and chimpanzees and two species of monkeys can read intent. Both great apes and humans (1) form concepts, (2) display insight, (3) are shaped by reinforcement in becoming tool users, (4) show remarkable numerical capacity, and (5) transmit cultural patterns.

Language

▶ Lectures: Vanishing Languages (p. 517); Universals of Language (p. 518)
▶ PsychSim 5: Dueling Brains (p. 517)

9-7. *Describe the structural components of a language*.

Language is our way of combining words to communicate meaning. Spoken language is built from basic speech sounds, called ***phonemes;*** elementary units of meaning, called ***morphemes;*** and words. Finally, language must have a ***grammar,*** a system of rules that enables us to communicate with and understand others. *Semantics* refers to the rules we use to derive meaning from sounds; *syntax* refers to the rules we use to order words into grammatically sensible sentences. Language becomes increasingly complex as we move from one level to the next.

▶ Lectures: Language Development (p. 519)
▶ Exercise/Lecture Break: Observing Language Development (p. 519)
▶ Worth Video Anthology: *Learning Language: Language Development in Infants and Toddlers;* Scientific American *Frontiers,* 3rd ed.: *Genes and Personality: Understanding Williams Syndrome*

9-8. *Identify the milestones in language development, and describe how we acquire language.*

Children's language development moves from simplicity to complexity. Their *receptive language* abilities mature before their *productive language*. Beginning at about 4 months, infants enter a ***babbling stage*** in which they spontaneously utter various sounds at first unrelated to the household language. By about age 10 months, a trained ear can identify the language of the household by listening to an infant's babbling. Around the first birthday, most children enter the ***one-word stage***, and by their second birthday, they are uttering two-word sentences. This ***two-word stage*** is characterized by ***telegraphic speech***. This soon leads to their uttering longer phrases (there seems to be no "three-word stage"), and by early elementary school, they understand complex sentences.

▶ Lecture: Talking With Our Hands (p. 521)
▶ Worth Video Anthology: *Chomsky's View of Language Development; Gleason's Wug Test*

B. F. Skinner believed the diversity of language could be explained by *association, imitation,* and *reinforcement*. Noam Chomsky notes that humans are biologically prepared to learn words and use grammar. Moreover, he believes that there is a *universal grammar* that underlies all human language.

Childhood does seem to represent a *critical period* for certain aspects of learning. Research indicates that children who have not been exposed to either a spoken or signed language by about age 7 gradually lose their ability to master any language. Learning a second language also becomes more difficult after the window of opportunity closes. For example, adults who attempt to master a second language typically speak it with the accent of their first. The impact of early experiences is also evident in the language learning of prelingually Deaf children born to hearing-nonsigning parents. Natively Deaf children who learn sign language after age 9 never learn it as well as those who lose their hearing at age 9 after learning English.

▶ Lecture: The Smart-Talk Syndrome (p. 522)

9-9. *Identify the brain areas involved in language processing and speech.*

Aphasia, an impairment of language, can result from damage to any of several cortical areas. ***Broca's area,*** an area in the left frontal lobe, controls language expression by directing the muscle movements involved in speech. ***Wernicke's area,*** an area in the left temporal lobe, controls language reception. Broca's area processes language through a series of neural computations. Language functions are distributed across other brain areas as well. Thus, in processing language, as in other forms of information processing, the brain operates by dividing its mental functions, but your conscious experience seems indivisible.

▶ Worth Video Anthology: *Teaching Language to Chimpanzees; Animal Language*

9-10. *Discuss whether other species share our capacity for language.*

Animals obviously communicate. Several teams of psychologists have taught various species of apes, including a number of chimpanzees, to communicate with humans by signing or by pushing buttons wired to a computer. Apes have developed considerable vocabularies. They string words together to express meaning and have taught their skills to younger animals. Skeptics point out important differences between apes' and humans' facilities with language, especially in their respective abilities to master the verbal or signed expression of complex rules of syntax. Nevertheless, studies reveal that apes have considerable ability to communicate.

Thinking and Language

▶ Lectures: The Vocabulary of Taste (p. 523); Think Before You Speak (p. 523); The Impact of Language on Thought (p. 524); New Words (p. 524)
▶ Exercise: Doublespeak (p. 525)
▶ Exercise/Critical Thinking Break: Verbal Information Can "Overshadow" Memory (p. 526)

9-11. *Describe the relationship between language and thinking, and discuss the value of thinking in images.*

Although Whorf's ***linguistic determinism*** hypothesis suggests that language determines thought, it is more accurate to say that language influences thought. Language expresses our thoughts, and different languages can embody different ways of thinking. Many bilinguals report that they have a different sense of self, depending on which language they use. According to the bilingual advantage, bilingual people are better at inhibiting attention to irrelevant information. We use language in forming categories, and words can influence our thinking about colors. Perceived differences grow when we assign different names to colors. Given the subtle influence of words on thinking, we ought to choose our words carefully. Studies of the effects of the generic pronoun *he* and the ability of vocabulary enrichment to enhance thinking reveal the influence of words. We might say that our thinking influences our language, which then affects our thoughts.

▶ Exercises: Introducing Imagery Research (p. 527); Mental Imagery (p. 527); Creating a Mental Model (p. 529)
▶ Project: Cognitive Maps (p. 528)
▶ Podcasts: Thought With(out) Language (Pods 1 and 2) (p. 526)
▶ Worth Video Anthology: Learning Through Visualization: A Gymnast Acquires New Skills

We often think in images. Artists, composers, poets, mathematicians, athletes, and scientists all find images to be helpful. Researchers have found that thinking in images is especially useful for mentally practicing upcoming events and can actually increase our skills. Research suggests that mental rehearsal can help us achieve an academic goal, although *process simulation* is more effective than *outcome simulation.*

Intelligence

▶ Lectures: Twelve Interesting Facts About Intelligence (p. 549); Intelligence as the Capacity to Adapt (p. 550); Artificial Intelligence (p. 579)
▶ Exercises/Projects: What Is Intelligence? (p. 549)
▶ Exercise/Podcasts: Computers, Robots, Machines: Simulating Intelligence and Other Human Traits (p. 581)

9-12. *Describe how psychologists define* intelligence, *and identify the arguments for* g.

As a socially constructed concept, ***intelligence*** varies from culture to culture. Thus, most psychologists now define intelligence as the ability to learn from experience, solve problems, and use knowledge to adapt to new situations.

▶ Exercise: The Factor Analysis Approach (p. 550)

Psychologists agree that people have specific abilities, such as verbal and mathematical aptitudes. However, they debate whether a ***general intelligence (g)*** factor runs through them all, as proposed by Charles Spearman. *Factor analysis* has identified several clusters of mental abilities. Still, there seems to be a tendency for those who excel in one of the clusters to score well on others.

▶ Lectures: Savant Syndrome (p. 551); Kim Peek's Brain (p. 553); Gardner's Theory of Multiple Intelligences (p. 553); Successful Intelligence (p. 555); The Psychology of Wisdom (p. 557)
▶ Exercises: Questionnaire for Business Management (p. 556); The Autism-Spectrum Quotient (p. 556); Sternberg's Balance Theory of Wisdom (p. 558)
▶ Feature Film: *Rain Man* and Savant Syndrome (p. 553)
▶ PsychSim 5: Get Smart (p. 550)
▶ Worth Video Anthology: *Savant Music Skills; Savant Art Skills: In Autism and Dementia*

9-13. *Compare Gardner's and Sternberg's theories of intelligence.*

Evidence that brain damage may diminish one ability but not others, as well as studies of ***savant syndrome***, led Howard Gardner to propose his theory of multiple intelligences. These include linguistic, logical-mathematical, musical, spatial, bodily-kinesthetic, intrapersonal, interpersonal, and naturalist. Robert Sternberg also proposes a *triarchic theory* of multiple intelligences in which he distinguishes among analytical (academic problem solving), practical, and creative intelligences.

▶ Lectures: Myths About Emotional Intelligence (p. 562); Emotional Intelligence: An Ability or Collection of Eclectic Traits? (p. 562); Ego-Resiliency (p. 563); Fostering Children's Emotional Intelligence (p. 564); Intelligence, Self-Discipline, and Academic Performance (p. 565)
▶ Exercises: Ten Facets of Emotional Intelligence (p. 561); Emotional Intelligence Scale (p. 561); "Reading the Mind in the Eyes" Test: Sample Items (p. 562)

9-14. *Describe the four components of emotional intelligence.*

Distinct from academic intelligence is *social intelligence,* an aspect of which is ***emotional intelligence.*** The four components of emotional intelligence are the abilities (1) to *perceive* emotions (to recognize them in faces, music, and stories), (2) to *understand* emotions (to predict them and how they change and blend), (3) to *manage* emotions (to know how to express them in varied situations), and (4) to *use* emotions to enable adaptive or creative thinking. Those who are emotionally smart often succeed in careers, marriages, and parenting where other academically smarter (but emotionally less intelligent) people fail. Critics of the idea of emotional intelligence argue that we stretch the idea of intelligence too far when we apply it to emotion.

▶ Exercises: A World War I IQ Test (p. 566); Issues in Testing (p. 568)
▶ Project: Joining Mensa (p. 566)
▶ Exercise/Project: Designing and Administering an Intelligence Test (p. 566)
▶ Worth Video Anthology: *Pros and Cons of Intelligence Tests; Locking Away the Feebleminded: A Shameful History*

9-15. *Discuss the history of intelligence testing, and explain how today's tests differ from early intelligence tests.*

An ***intelligence test*** assesses people's mental abilities and compares them with others, using numerical scores. Aptitude refers to the capacity to learn, and thus ***aptitude tests*** are those designed to predict a person's future performance***. Achievement tests*** are designed to assess what a person has learned.

The modern intelligence-testing movement started at the turn of the twentieth century when French psychologist Alfred Binet began assessing intellectual abilities. Together with Théodore Simon, Binet developed an intelligence test containing questions that assessed ***mental age*** and helped predict children's future progress in the Paris school system. The test sought to identify French school children needing special attention.

Lewis Terman believed that intelligence was inherited. Like Binet, he believed that his test, the ***Stanford-Binet,*** could help guide people toward appropriate opportunities. William Stern derived the ***intelligence quotient,*** or ***IQ,*** for Terman's test. The IQ was simply a person's mental age divided by chronological age multiplied by 100.

The ***Wechsler Adult Intelligence Scale (WAIS)*** is the most widely used intelligence test. It consists of 15 subtests and yields not only an overall intelligence score but also separate verbal comprehension, perceptual organization, working memory, and processing speed scores. Striking differences between these scores can provide clues to cognitive strengths that a teacher or therapist might build on. Other comparisons can help clinicians identify a possible reading or language disability.

9-16. *Describe a normal curve, and explain what is meant when we say that a test has been standardized and is reliable and valid.*

Because scores become meaningful only when they can be compared with others' performances, they must be defined relative to a pretested group, a process called ***standardization***. Obviously, the group on which a test is standardized must be representative of those who will be taking the test in the future. Standardized test results typically form a normal distribution, a bell-shaped pattern of scores that forms the ***normal curve.*** Most scores cluster around the average, and increasingly fewer are distributed at the extremes.

▶ Exercises: Reliability and Validity (p. 570); Remote Associates Test (p. 570)
▶ Exercise/Project: Understanding Predictive Validity (p. 569)

Reliability refers to the extent to which a test yields consistent scores. Consistency may be assessed by comparing scores on two halves of the test, on alternative forms, or on retesting. A test can be reliable but not valid.

Validity refers to the extent to which a test measures or predicts what it is supposed to. ***Content validity*** is determined by assessing whether the test truly samples the pertinent behavior, or *criterion*. For example, driving tests should measure driving ability. ***Predictive validity*** is determined by computing the correlation between test scores and the criterion behavior. Aptitude tests have predictive validity if they can predict future achievement. The predictive power of aptitude scores diminishes as students move up the educational ladder.

▶ Worth Video Anthology: *Psychologist Ellen Winner Discusses "Gifted Children"*

9-17. *(Close-Up) Describe the traits of those at the low and high intelligence extremes.*

At one extreme of the normal distribution are people whose intelligence scores fall below 70. To be labeled as having an ***intellectual disability*** (formerly referred to as *mental retardation*), a child must have both a low test score and difficulty adapting to the normal demands of living inde-

pendently. Intellectual disability sometimes results from known physical causes, such as ***Down syndrome,*** a disorder of varying severity that is attributed to an extra chromosome in the person's genetic makeup. Most mentally challenged adults can, with support, live in mainstream society.

At the other extreme are the "gifted." Contrary to the popular myth that they are frequently maladjusted, research suggests that high-scoring children are healthy, well adjusted, and academically successful.

▶ Lectures: Why Do Intelligent People Fail? (p. 571); Are Intelligent People Happier? (p. 572); Giftedness (p. 572); Achievement in Later Life (p. 573)

9-18. *Describe how aging affects crystallized and fluid intelligence.*

Crystallized intelligence—our accumulated knowledge, increases up to old age. ***Fluid intelligence***—our ability to reason speedily and abstractly—decreases beginning in the twenties and thirties. Developmental psychologists use *longitudinal studies* (restudying the same group at different times across their life span) and *cross-sectional studies* (comparing members of different age groups at the same time) to study the way intelligence and other traits change with age.

These cognitive differences help explain why mathematicians and scientists produce much of their most creative work during their late twenties or early thirties, when fluid intelligence is at its peak. In contrast, people working in literature, history, and philosophy tend to produce their best work in their forties, fifties, and beyond.

▶ Lectures: Genes and Intelligence (p. 574); Misunderstanding Heritability
▶ Exercise: Incremental Versus Entity Theories of Intelligence (p. 573)

9-19. *Discuss the evidence for a genetic influence on intelligence, and explain what is meant by heritability.*

Studies of twins, family members, and adopted children together point to a significant genetic contribution to intelligence scores. The most genetically similar people have the most similar scores ranging from +.85 for identical twins raised together, to about +.33 for unrelated individuals raised together. ***Heritability*** refers to the extent to which differences among people are attributable to genes. To say that the heritability of intelligence is 50 percent does not mean that half of an individual's intelligence is inherited. Rather, it means that we can attribute to heredity 50 percent of the variation of intelligence among those studied. Estimates of the heritability of intelligence range from 50 to 80 percent. Mental similarities between adopted children and their adoptive families wane with age, until the correlation approaches zero by adulthood.

However, intelligence appears to be *polygenetic,* involving many genes, with each gene accounting for much less than 1 percent of intelligence variations. Researchers have pinpointed specific genes that seemingly influence variations in intelligence and learning disabilities.

Studies of twins, family members, and adopted children also provide evidence for environmental influences on intelligence. The intelligence test scores of fraternal twins raised together are more similar than those of other siblings, and the scores of identical twins raised apart are less similar than the scores of identical twins raised together.

▶ Worth Video Anthology: *Mother Tries to Teach Her Two-Year-Old Multiplication*

9-20. *Discuss the evidence for environmental influences on intelligence.*

Studies of children reared in extremely neglectful or enriched environments indicate that life experiences significantly influence intelligence test scores. For example, research indicates that schooling and intelligence contribute to each other (and that both enhance later income).

9-21. *Describe how and why the genders differ in mental ability scores.*

Although gender similarities far outnumber gender differences, we find the differences in abilities more interesting. Research indicates that, compared with boys, girls are better spellers; are more verbally fluent; are better at locating objects; are more sensitive to touch, taste, and color; and are better emotion detectors. Males' mental ability scores vary more than females', and thus boys out-

number girls at both the low extreme and the high extreme. Boys outperform girls in spatial ability tests and at solving complex math problems, but in math computation and overall math performance boys and girls hardly differ. According to different perspectives, these differences may be explained as evolutionarily adaptive for each gender or the result of social expectations and divergent opportunities.

▶ Lectures: Environmental Explanation of Group Differences (p. 577); Intelligence as Culturally Defined (p. 577); The SAT Reasoning Test: A Case Study in Testing
▶ Exercises: Blacks as a "Castelike" Minority (p. 576); Culture-Biased and Culture-Fair Tests (p 577)

9-22. *Describe how and why racial and ethnic groups differ in mental ability scores.*

White Americans have outscored Black Americans on intelligence tests, but this Black-White difference has diminished somewhat in recent years, especially among children. European New Zealanders outscore native Maori New Zealanders, Israeli Jews outscore Israeli Arabs, and most Japanese outscore the stigmatized Japanese minority. Research suggests that environmental differences are largely responsible for these group differences. Consider: (1) genetics research indicates that the races are remarkably alike under the skin; (2) race is not a neatly defined biological category; (3) intelligence test performance of today's better-fed, better-educated, and more test-prepared population exceeds that of the 1930s population by the same margin that the score of the average White today exceeds that of the average Black; (4) when Blacks and Whites have or receive the same pertinent knowledge, they exhibit similar information-processing skill; (5) schools and cultures matter; and (6) in different eras, different ethnic groups have experienced periods of remarkable achievement.

9-23. *Discuss whether intelligence tests are inappropriately biased.*

Intelligence tests are "biased" in the sense that they are sensitive to performance differences caused by cultural experience. However, tests are not biased in that they predict as accurately for one group as they do for another. For example, the predictive validity is roughly the same for men and women, for various races, and for rich and poor. ***Stereotype threat*** is a self-confirming concern that one will be evaluated based on a negative stereotype. The phenomenon sometimes appears in intelligence testing among minorities and women.

HANDOUT 9-1

Fact or Falsehood?

T F 1. In general, people underestimate how much they really know.

T F 2. It takes less compelling evidence to change our beliefs than it did to create them in the first place.

T F 3. The babbling of an infant at 4 months of age makes it clear whether the infant is French, Korean, or Ethiopian.

T F 4. Many bilinguals report that they have different senses of self, depending on which language they are using.

T F 5. Imagining a physical activity triggers action in the same brain areas that are triggered when actually performing that activity.

T F 6. Only human beings seem capable of insight (the sudden realization of a problem's solution).

T F 7. Apes are capable of communicating meaning by using symbols.

T F 8. Research suggests that a common ingredient of expert performance in chess, dancing, sports, and music is about a decade of intense daily practice.

T F 9. The concern with individual differences in intelligence is strictly a twentieth-century American phenomenon.

T F 10. As adopted children grow older, their intelligence scores become more similar to those of their biological parents than to those of their adoptive parents.