1: Thinking Critically With Psychological Science

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CHAPTER OBJECTIVES

After completing their study of this chapter, students should be able to:

1. Describe hindsight bias, and explain how it can make research findings seem like mere common sense.
2. Describe how overconfidence contaminates our everyday judgments.
3. Explain how the scientific attitude encourages critical thinking.
4. Describe how psychological theories guide scientific research.
5. Identify an advantage and a disadvantage of using case studies to study behavior and mental processes.
6. Identify the advantages and disadvantages of using surveys to study behavior and mental processes, and explain the importance of wording effects and random sampling.
7. Identify an advantage and a disadvantage of using naturalistic observation to study behavior and mental processes.
8. Describe positive and negative correlations, and explain how correlational measures can aid the process of prediction.
9. Explain why correlational research fails to provide evidence of cause-effect relationships.
10. Describe how people form illusory correlations.
11. Explain the human tendency to perceive order in random sequences.
12. Explain how experiments help researchers isolate cause and effect.
13. Explain why the double-blind procedure and random assignment build confidence in research findings.
14. Explain the difference between an independent and a dependent variable.
15. Explain the importance of statistical principles, and give an example of their use in everyday life.
16. Explain how bar graphs can misrepresent data.
17. Describe the three measures of central tendency, and tell which is most affected by extreme scores.
18. Describe two measures of variation.
19. Identify three principles for making generalizations from samples.
20. Explain how psychologists decide whether differences are meaningful.
21. Explain the value of simplified laboratory conditions in discovering general principles of behavior.
22. Discuss whether psychological research can be generalized.
23. Explain why psychologists study animals, and discuss the ethics of experimentation with both animals and humans.
24. Describe how personal values can influence psychologists’ research and its application, and discuss psychology’s potential to manipulate people.
CHAPTER OUTLINE

I. Introduction (p. 19)

Introductory Exercise: Fact or Falsehood?
The correct answers to Handout 1–1, as shown below, can be confirmed on the listed text pages.

1. F (p. 20) 6. T (p. 29)
2. F (p. 22) 7. F (p. 32)
3. F (p. 27) 8. F (p. 45)
4. T (p. 28) 9. F (p. 48)
5. T (pp. 28–29) 10. F (p. 50)

II. The Need for Psychological Science (pp. 19–26)

Videocassette: Discovering Psychology, Updated Edition: Understanding Research (Annenberg/CPB Project, 27 minutes)

This Discovering Psychology program describes how psychologists use the scientific method to study human behavior. Researchers use interviews, surveys, psychological tests, and experiments to separate fact from fiction. The program reviews several concepts and principles from text Chapter 1, including hypothesis testing, correlation, replication, experimental and control conditions, the placebo effect, and the double-blind procedure. Those who understand the scientific process, argues narrator Philip Zimbardo, are better equipped to think critically and to evaluate everyday claims about human nature. Highlights include Christina Maslach’s studies of burnout, Jerome Frank’s discussion of psychic healers, Daryl Bem’s “mind-reading” demonstration, and Leonard Saxe’s evaluation of the polygraph.

The entire Discovering Psychology series (26 half-hour programs) can be purchased in either VHS or DVD format for $389. Some video programs can also be purchased individually. Call 1-800-LEARNER for more information or to order.

A. The Limits of Intuition and Common Sense (pp. 19–22)

Videocassette: Scientific American Frontiers, 2nd ed., Segment 3: Aliens Have Landed?

See the Faculty Guide that accompanies the Scientific American Frontiers series for a description.

Classroom Exercises: The Limits of Human Intuition

For a simple opening demonstration of how our intuition stumbles ask students to solve the following simple addition problem in their heads: Begin with 1000 and add 40 to it. Add 1000. Then add another 30 followed by another 1000. Next add 20. Add another 1000. Finally, add 10. What is the sum? Most will call out “5000.” Placing the numbers on the chalkboard clearly yields a total of 4100.

Daniel Kahneman offers two examples of how our intuition can stumble. One is that when different groups of people are asked how many murders there are annually in Michigan and how many there are in Detroit, the median answers are 100 and 200, respectively. You can ask each question in writing to different halves of your class and then tabulate the results to demonstrate the flaw. Alternatively, pose the first question to your entire class and give them time to write down an answer. Simply posing the second question will elicit smiles, as many students will immediately recognize that they underestimated in answering the first question. The second example is the birthday coincidence, provided as a Classroom Exercise on page 30 of this resource chapter.

For yet another demonstration of the limits of human intuition, fill a glass completely with water, and place it on your desk or lectern. Ask students what will happen if you slip a penny into the glass. Will the glass overflow? Many will say, “yes,” others “no.” Slip the penny in to demonstrate. Now ask, “How many pennies do you think we can add without having any water flow over the edge?” Begin slipping in pennies. You will be able to drop dozens in a medium-sized glass. In fact, Ivan Moscovich reports adding as many as 52. Counter to human intuition, water has a high surface tension, behaving as though it has a flexible skin. That skin pulls inward and resists breaking. The glass of water will develop a great bulge before the water flows over the edge. You can demonstrate how the surface tension can even support the weight of light objects. Place a clean razor blade flat against the surface and it floats, not because of buoyancy but because of the support of surface tension.

Moscovich demonstrates other counterintuitive findings you can illustrate in class. For example, place a long thin strip of wood on a desk or table so that about 5 inches extend over the edge. Then lay a few newspapers over the wood strip and smooth down the paper allowing all the air to escape. What will happen when you strike the extended end of the wood strip? Contrary to our intuition, the strip under the paper will not move. You can even snap the woodstrip and the newspaper will not budge. The weight of the atmosphere pressing on the newspaper holds the stick firmly to the table. (Actually, the pressure of air is 1 kilogram on every square centimeter for a total of about 2.25 metric tons over the surface of the newspaper.)

What happens if we suspend two lightweight beach balls a short distance from each other and then blow air between the balls? The balls will begin to move toward each other. Why? The air moving between the balls has a lower pressure than the surrounding air that presses them together.
In *Uncommon Sense: The Heretical Nature of Science*, physicist Alan Cromer gives many examples of how our intuition is often wrong when it comes to physical reality. For example, drawing on their casual observations of falling objects, many people wrongly believe that bombs dropped from planes fall straight down. You might present some of Cromer’s examples in class. For example:

1. If you drop a bullet off a table 3 feet high, and fire another one straight across an empty football field, which hits the ground first? Although intuition tells us that the dropped bullet lands first because it has only three feet to travel, in reality both bullets hit at the same time because downward velocity is independent of horizontal velocity.

2. A ball rolls down a spiral track. The end of the track curves left. What path does the ball take when it leaves the track? Although intuition suggests that it curves, because an object continues to move in the same direction, the correct answer is that it follows a straight line to the left. Only objects acted on by a constant lateral force curve.

3. A wooden cube is 1 inch long on each side. How many cubes form a cube 2 inches along each side? Intuition says two, because a 2-inch cube is twice as big as a 1-inch cube. The solution is actually eight. Two cubes make a tower. For a cube, you need two layers of 4.

Cromer argues that the formal thinking needed for math and science does not follow a natural development, as psychologists such as Jean Piaget have claimed. “Science and objective thinking are unnatural activities,” argues Cromer. “The mind wasn’t designed to study physics.” Clearly, Cromer’s ideas have important implications for teaching science. If few people are able to master formal, logical thinking naturally in the course of development, we cannot assume it, and we must build the mental structures needed to understand science.

Art Kohn’s 15-minute classroom activity demonstrates not only the limits of intuition but also the value of empirical investigation. Present three empty envelopes to your class and then indicate that you are placing a $1 bill in one of them. Seal all three and then shuffle them so that no one, not even yourself, knows the location of the dollar. (To be certain no one sees the bill through the envelope, it may be wise to put some folded paper in each.) Announce that a volunteer who picks the right envelope can keep the money. After the volunteer has made the selection, examine the contents of the two unchosen envelopes, and reveal that one of them does not contain the $1 bill. Then, holding up the remaining unchosen envelope, ask the crucial question: “In your opinion, should the volunteer keep the one chosen or switch to my envelope?” Kohn reports that typically at least half his students favor staying, 20 to 30 percent favor switching, and 10 to 20 percent argue that it makes no difference.

Invite your students to test their intuitions with an experiment. Have them work in pairs, with one member being the experimenter and the other the research participant. Each experimenter should construct a record sheet having four columns headed “Correct Answer,” “Participant’s Choice,” “Stay/Switch,” and “Win/Lose,” respectively, and rows numbered 1 to 20. Finally, the experimenters should complete the “Correct Answer” column with a random assortment of the letters A, B, and C.

Experimenters now follow the procedure you just demonstrated. On each trial they should first ask their research participants to guess either A, B, or C, then reveal that one of the unchosen options is wrong, and finally offer participants the option of staying or switching. For example, if on a given trial the correct answer is A and the participant picks C, then the experimenter would inform him or her that B is an incorrect choice, and offer the participant the choice of switching to A. When the correct answer is A and the student chooses A, then the experimenter should reveal that B (or C) is a wrong choice and offer the chance to switch. For each of the 20 trials, the experimenter records the student’s first choice, whether the student switched, and whether the student ultimately made the right choice. After all pairs have finished, the experimenters should calculate the number of times that switching led to a win and the number of times that staying led to a win. Finally, you should combine all the results and compare the percentage of wins that resulted from switching with the number from staying. Switching will clearly emerge as the better strategy by a ratio of 2 to 1.

Clearly, this outcome is counterintuitive. In fact, Kohn notes that when newspaper columnist Marilyn vos Savant in 1990 answered a similar question correctly, protests were voiced by many mathematicians across the country. It may help to explain to your students that the initial probability that the participant has the $1 is one in three; the probability that the experimenter has it is two in three. Note that once the participant selects the envelope, the envelope becomes a set that is independent of the experimenter’s set. When the experimenter eliminates a certain loser from his or her set, that act in no way changes the probability that the participant holds the winner. As a result, the participant is better off switching.


**Lecture/Discussion Topic: Misremembering the Causes of Behavior**

We are all amateur psychologists, suggested Fritz Heider, who attempted to explain others’ behavior (see Chapter 18). That need for a coherent world, however, sometimes leads to error.

You can extend the text discussion of the limits of intuition and common sense with Sharon L. Hannigan and Mark Tippen Reinitz’s fascinating study of “causal inference” errors. In a series of three experiments, they showed how memory “illusions” may occur as people attempt to make sense out of events. Research participants saw pictures depicting some kind of “effect,” for example, oranges sprawled on a supermarket floor or a student toppling onto the floor. Hannigan and Reinitz later showed the same participants a picture of the most probable cause of the effect—someone reaching for an orange from the bottom of the stack or a student leaning back in a chair—and asked them if they had seen the picture before. A statistically significant number said they had. In an effort to understand their world, the participants filled in the gaps of missing scenes by claiming they saw the pictures there in the first place. Their causal reasoning may have been accurate but their memories were illusions. Confident but incorrect.

“It is surprising that just a few minutes after seeing the effect scene, people would reliably claim to have seen the cause scene,” says Reinitz. “After all, we tend to believe that we can accurately remember what we saw just a few minutes ago.” Memory for pictures tends to be more accurate than memory for words. “We put a lot of confidence in things that we have seen with our own eyes,” suggests Reinitz, “so applications to real-world situations are probably more varied and interesting than would be the case if we used text.”

Hannigan and Reinitz found that memory errors increased with longer retention intervals. Application to eyewitness testimony in the courtroom is clear. Typically, cases go to trial many months after the events occur, very likely making eyewitnesses more vulnerable to inference-based errors. Misremembering the causes of others’ behavior over long periods may also foster conflict in social relationships.

Importantly, the research indicated that causal-inference errors were common in a backward but not a forward direction. That is, exposure to “effect” pictures caused illusory memories of seeing “cause” pictures, but exposure to “cause” pictures did not produce false memories of seeing “effect” pictures. The researchers speculate that there is a stronger need to answer “Why?” than to answer “What would happen if . . . ?”


**Classroom Exercise: The Hindsight Bias and Predicting Research Outcomes**

The tendency to exaggerate one’s ability to have foreseen how something would turn out after learning the outcome can readily be demonstrated in class. The demonstration should be performed, however, before students have read the chapter. If you prefer, you can use the text example regarding the effects of separation on romantic attraction.

Use Handout 1–2 (compliments of John Brink) if you want to use a different example. Cut the sheets in half and alternate them so that each student has a finding opposite to that of the person sitting next to him or her. After students have responded to the questions, explain the phenomenon and suggest that it is powerful enough to demonstrate in class. Ask, “How many of you were surprised by the finding?” There will be one or two hands in a class of 30. Ask how many checked “not surprising,” and virtually every hand will rise. Continue, “But there’s a problem, for half of you were given a finding that is opposite to what the other half received, as you can see by comparing with the person next to you.”

John Brigham reports that in the week before football’s 1985 Super Bowl, he asked a group of students to predict the outcome anonymously. Most (81 percent) predicted that the Miami Dolphins would win. A significant number (40 percent) thought the victory would be by more than 10 points. A week after the San Francisco 49ers’ decisive victory, he asked another group to remember their pre-game predictions. The majority (58 percent) remembered predicting that the 49ers would win. No one remembered thinking Miami would win by at least 10 points. You may want to replicate Brigham’s study as a classroom demonstration (most easily done if you have more than one psychology class) or as a student project. Have one class predict the outcome of a sporting event or election (national or local) and another class remember their predictions after the outcome is known. The numbers are likely to illustrate the hindsight bias. A *USA Today/CNN/Gallup* poll taken immediately after the *Columbia* disaster in February 2003, reported that nearly three-quarters of Americans said that they had felt that such a spaceflight disaster would occur again (like the *Challenger* disaster). In fact, such shuttle flights have become so common that most
Americans were probably not even aware that Columbia was in space until its tragic end.

Gordon Wood suggests some implications of the hindsight bias for everyday decision making that might also be presented to your class. Jurors may be unable to ignore information even when so instructed by a judge, because once they know, they may believe they knew it all along. We may also second-guess decision makers after we know the outcome because we readily forget our previous knowledge state. All of us may have difficulty learning from experience if we fail to realize that experience has altered our knowledge. Wood suggests that throughout the course it is wise to have students predict the results of a study before presenting the findings. Very likely, they will become less susceptible to the hindsight bias.


Classroom Exercise: The Overconfidence Phenomenon

The tendency to overestimate the accuracy of our current knowledge is a powerful phenomenon and readily demonstrated in class.

a. Perhaps the simplest demonstration of the tendency is to have students predict their score on a multiple-choice or another type of short-answer test, such as the Fact or Falsehood exercise that accompanies each chapter, immediately after they have completed it (have them note their estimate at the top of the test). The majority will overestimate the number of questions they got right. While the strength of this tendency will depend to some degree on the amount of feedback they have received on previous tests, I have found that students continue to overestimate throughout the semester.

b. Handout 1–3 presents several questions like those commonly used in research to assess overconfidence. If your students are as correct as they are confident, only 2 percent of their responses should be wrong. Thus, if each of 50 students responds to the 5 questions, there should be a total of 5 errors (50 × 5 × 0.02 = 5). The actual proportion of errors will be more than 10 times that. After students have completed the questions, you may wish to collect, shuffle, and redistribute them so that students need not report their own mistakes. By a show of hands, count the number of errors for each item after providing the correct answers below.

Overconfidence will be obvious.

1. 3.6 million square miles
2. 19.7 million people
3. 385 deaths
4. 219,000 female engineers
5. 441 nuclear plants

c. Chapter 10 of these resources contains additional activities for demonstrating the overconfidence phenomenon. The specific activity accompanying Handout 10–8 could be used at this point in the course. It can loosen up a stiff class early in the semester as well as illustrate our tendency to be overconfident. Jane Jegerski notes that plotting student accuracy of detecting lying approximates a normal curve with the mean being 50 percent correct, just what we would expect by chance or by flipping a coin. You can anticipate the text discussion of the normal curve in this chapter by creating a bar graph on the blackboard with the number of students on the vertical axis and the percentage correct (10, 20, 30, and so on) on the horizontal axis. After creating the figure, ask students, “What does the bar graph tell us about our ability to detect lies?”

Cerf and Navasky provide the following delightful examples of overconfidence among experts that you might read to your class.

“There is no reason for anyone to have a computer in their home.” (Ken Olson, president of Digital Equipment Company, 1977)

“Heavier-than-air flying machines are impossible.” (Lord Kelvin, British mathematician, physicist, and president of the British Royal Society, 1895)

“Reagan doesn’t have the presidential look.” (United Artists Executive when asked whether Ronald Reagan should be offered the starring role in the movie The Best Man, 1964)

“A severe depression like that of 1920–21 is outside the range of probability.” (Harvard Economic Society, Weekly Letter, November 16, 1929)

“Impossible!” (Jimmy “The Greek” Snyder when asked whether Cassius Clay could last six rounds in his upcoming bout with heavyweight champion Sonny Liston, 1964)

“We know on the authority of Moses, that longer ago than six thousand years, the world did not exist.” (Martin Luther [1483–1546], German leader of the Protestant Reformation)

“Man will never reach the moon, regardless of all future scientific advances.” (Lee DeForest, inventor of the vacuum tube, 1957)

“Nuclear powered vacuum cleaners will probably be a reality within 10 years.” (Alex Lewyt, manufacturer of vacuum cleaners, 1955)

A more recent example: Following the 1986 Challenger explosion, Nobel prize-winning physicist Richard Feynman asked NASA officials what risk of failure each mission carried. NASA engineers said
about 1 in 100 flights was likely to experience a catastrophe. NASA managers put the risk closer to 1 in 100,000. Some experts speculate that managers’ overconfidence may have contributed to the Columbia disaster in February 2003.


Classroom Exercise: The Confirmation Bias
Overconfidence stems partly from our tendency to search for information that confirms our preconceptions. It is easily demonstrated with one of Peter Wason’s four-card problems. Prepare four cards, containing (1) a black circle (with a black triangle on the other side), (2) a red circle (with a black triangle on the other side), (3) a red triangle (with a black circle on the other side), and (4) a black triangle (with a red circle on the other side). Instruct students: “Assuming that each card has a triangle on one side and a circle on the other, which card or cards need to be turned over to test this statement: ‘Every card that has a black triangle on one side has a red circle on the other?’” Most people answer “black triangle” or “black triangle and red circle” attempting to confirm the rule. The correct answer is black triangle (which would confirm the rule) and black circle (which would disprove the rule).

Another way to demonstrate the confirmation bias is to play an inverse game of “Twenty Questions.” This can be done either as a classroom exercise or as a student project. In this game contestants are provided the general category and need to discover the specific instance. In the inverted game they are given the specific instance, say, “a Siamese cat,” and must discover the general category, say, “all living things.” Questioners should be told to announce an answer when they are confident they have discovered it. A tendency to verify rather than disconfirm their hunches will lead many questioners to announce a category that is too narrow.

Both anecdotal and research evidence point to our preference for confirming information. For example, in Why Children Fail, John Holt describes schoolchildren who were given 20 questions to identify an unknown number between 1 and 10,000. He reports that they cheered when the teacher told them, “Yes, it is between 5,000 and 10,000,” but groaned when informed, “No, it’s not between 5,000 and 10,000.” Although these statements were equally informative, the second had to be converted to the recognition that the number is between 1 and 5,000.

Similarly, in an experiment, investigators asked one group of participants to assess whether practice the day before a tennis match is related to winning the match and a second group to assess whether practice the day before is related to losing. Those assessing whether practice leads to winning preferred information showing the number of times players practiced and won; those assessing whether practice leads to losing preferred information showing the number of times players practiced and lost.

B. The Scientific Attitude (pp. 23–24)

Classroom Exercise: A Psychic Reading
The text discussion of the scientific attitude raises the question, “Can some people demonstrate ESP?” Magician James Randi, whose views are presented in the text, exemplifies skepticism because he has tested and debunked a variety of psychic phenomena.

Timothy Lawson suggests a psychic-reading demonstration that encourages students to approach the world of behavior with a scientific attitude—a curious skepticism. The demonstration specifically aims to foster critical thinking. Certain to impress your students the first or second week of class, the psychic reading relies on “cold-reading” (providing general descriptions that apply to most people) and “hot-reading” (obtaining specific details about the “volunteer” in advance).

Suggest that you are going to do a psychic reading in class and that you need a “volunteer.” Act as if you are choosing a student randomly (e.g., “Let’s get someone from the first row”) but make your choice ahead of time. Have the student come forward and hand you one from the first row) but make your choice ahead of time. Act as if you are choosing a student randomly (e.g., “Let’s get someone from the first row”) but make your choice ahead of time. Have the student come forward and hand you some personal possession—a pen, dorm or car keys—and concentrate intently. Make some general descriptive statements that would apply to most people—“You are outgoing at times, but reserved at other times,” “You are fairly even-tempered, but sometimes get very angry,” “You enjoy helping others.” Then slowly reveal more detailed information; do so bit by bit as if it is coming gradually to you and only with considerable effort. Begin with vague information that becomes more specific (e.g., “I see the letters WR, what does that mean? Did you play wide receiver?”) In one reading, Lawson disclosed that one of his students grew up in a single-parent household, was once the captain of his high school’s cross-country team, won a Burger King A+ Award for his cross-country achievements, and suffered a broken leg when hit by a truck as a child. Your accuracy will shock and amaze most students.

How is it done? Lawson explains that it’s simply a matter of obtaining detailed information about a student or two before class. To avoid invasion of privacy, he recommends using only public sources of information.
The World Wide Web contains student Web pages, which are the best source. Often it is easiest to find information about student athletes.

After the reading, have students form small groups to evaluate the “reading.” Ask them to determine (a) if a target person’s acknowledgment of the accuracy of a reading is good evidence for psychic ability, (b) whether there are alternative explanations for the accuracy of the reader’s statements, and (c) how they might design a test for psychic ability.

In discussing the demonstration, admit you are not psychic. After careful reflection, some students (and small groups) are likely to note that you made vague statements that apply to most people. Others will state that you could have obtained information about the target person in advance. Explain how you obtained the information. Suggest that one could test a psychic by asking questions about which the psychic would have no information (e.g., the student’s favorite high school teacher). Lawson also recommends that you inform students that your search for information was restricted to one or two students, included only publicly available sources, and was performed only for purposes of the demonstration. Finally, admit that the demonstration required temporary deception, an important ethical issue in the conduct of research with human participants.


Lecture/Discussion Topic: Your Teaching Strategies and Critical Thinking
To master any subject, one must actively process it. It is probably wise to tell students from the outset that you intend to put that principle into practice in the classroom in a variety of ways. For example, classroom exercises and demonstrations, project ideas, small-group discussions, and student debates are all designed to encourage active learning.

To encourage active listening and participation, you might utilize a practice suggested by Randolph Smith (Ouachita Baptist University). (It has the added benefit of allowing you to monitor class attendance efficiently.) Explain to students that each day, as they enter the class, they will receive a small slip of paper on which they are to sign their name. They may also write down any question(s) they do not wish to raise in class. On the way out, they should leave the paper on your desk. You can then devote the first part of the next session to a discussion of the issues raised by students. Not only does this give you time to think about students’ questions and concerns, it also gives you a chance to review the highlights of the previous day’s presentation. Equally important, you will have a very good idea of how well students comprehend your lecture. Smith reports that the technique both increases the quantity and quality of questions and raises the general level of classroom discussion.

The text chapter also indicates that the study of psychology can help us to think critically. In class, you might note how the scientific approach can help us evaluate competing claims and ideas regarding phenomena ranging from subliminal persuasion, ESP, and mother-infant bonding to astrology, basketball streak-shooting, and hypnotic age regression. Explain to your students that an important goal of the course is to teach questioning thinking that examines assumptions, discerns hidden values, evaluates evidence, and assesses conclusions. To promote the development of this skill, Jane S. Halonen has written The Critical Thinking Companion for Introductory Psychology, and its organization closely parallels that of the text. The book, which students can work through on their own, provides critical thinking exercises for all the major topics in psychology.

In addition, Teaching Critical Thinking in Psychology, edited by Halonen, is an excellent resource for the classroom. This book reflects the efforts of a team of 10 psychologist-teachers who gathered for two summers at Alverno College to devise a model of critical thinking and to promote the teaching of this ability in psychology courses. The book provides many useful critical thinking exercises for the introductory psychology classroom.

Familiarity with the critical thinking model presented in the book will prove helpful in your teaching. Briefly, the model recognizes that students enter the classroom with a knowledge base composed of facts, beliefs, assumptions, and values derived from their own life experiences and past education. With this knowledge base they construct a personal theory about every person, thing, or event they encounter. Sometimes this is easy to do. Other times it is not so easy, and it is in these cases that critical thinking is most likely to be stimulated. That is, when students sense discrepancies, they are motivated to seek information that leads to a new, tentative personal theory. In evaluating the new theory, they may advocate their position publicly and elicit feedback. Assuming that the new position is satisfying, they conclude the process by integrating the revised personal theory into their knowledge base.

The model suggests that instructors can strengthen their students’ critical thinking skills by creating a climate in which the students are confronted with discrepancy, are encouraged to examine their personal theories, and are free to express their thoughts publicly. By introducing provocative stimuli that typically generate both discrepancy and lively discussion, the exercises in both of Halonen’s books will help instructors accomplish this goal.


Classroom Exercise: Critical Inquiry and Psychology
The text gives specific examples of how psychology’s critical inquiry has produced surprising findings that have sometimes debunked popular beliefs. The Fact or Falsehood exercise provided in the Preface of these resources (Handout IR–1) provides many more; if you did not use it earlier, you may choose to do so now. The Prologue of these resources also provides a teaching strategy for promoting critical thinking in psychology on page 15 of that chapter.

Lecture/Discussion Topic: Critical Thinking
There are many sources of information about and activities regarding critical thinking. Here are some good ones.

In Intuition: Its Powers and Perils, David Myers tries to enhance readers’ powers of critical thinking. “When forming judgments and making decisions—in business, politics, sports, religion, and other everyday realms—discerning people,” Myers suggests, “will welcome the powers of their gut wisdom yet know when to restrain it with rational, reality-based critical thinking.” He discusses the powers and perils of intuition when judges and jurors make judgments about truth-telling; when mental health workers predict whether someone is at risk for suicide; when coaches, players, and fans decide whether a basketball player has the hot hand; when personnel directors must evaluate job applicants for a new position; and when psychics claim to be clairvoyant or to have precognitive powers. Our intuitions provide us with useful insights but they can also seriously mislead us. The scientific method provides us with a very important tool in helping us sift sense from nonsense.

John Marton’s Fables for Developing Skeptical and Critical Thinking in Psychology uses the power of narrative to improve students’ critical thinking skills. The book consists of ten interconnected “fables” in which a young woman student and a semi-retired eccentric female professor together encounter a variety of psychological puzzles, including claims of psychic powers, unidentified flying objects, confabulated memories, and difficult-to-explain gender miscommunications. The two characters join together in demonstrating critical thinking as well as the more general attitudes that underlie application of the scientific method. The fables illustrate how illusory correlation, confirmation bias, hindsight bias, mental sets, and selective attention underlie common misconceptions. The topics of the fables parallel the organization of the Myers’ text. For example, the first five fables deal with critical thinking, sensation and perception, consciousness, learning, and memory. Written as an activity or discussion supplement to the standard introductory text, the book truly fosters active learning.

Randolph A. Smith’s Challenging Your Preconceptions: Thinking Critically About Psychology was designed to supplement an introductory psychology text and will help your students apply their critical thinking skills to the major content areas of psychology. It contains separate chapters on issues in statistics and research, the biological basis of behavior, sensation and perception, states of consciousness, learning, memory, testing, motivation, psychological disorders, therapy, and social psychology, for example. In the first chapter, Smith provides the following guidelines for critical thinking that will extend the text definition.

1. Critical thinkers are open-minded. They can live with uncertainty and ambiguity. They enjoy mysteries, avoid easy compartmentalizations of the world, and resist black-white analyses of complex issues.
2. Critical thinkers are able to identify inherent biases and assumptions. They know that people’s beliefs and experiences shape the way they view and interpret their worlds.
3. Critical thinkers practice an attitude of skepticism. They have trained themselves to question the statements and claims of even those people they respect. They are ready to reexamine their own ideas.
4. Critical thinkers distinguish facts from opinions. They recognize the need to rely on scientific evidence rather than personal experience.
5. Critical thinkers don’t oversimplify. They realize the world is complex and there may be multiple causes for behavior.
6. Critical thinkers use the processes of logical inference. They carefully examine the information given and recognize inconsistencies in statements and conclusions.
7. Critical thinkers review all the available evidence before reaching a conclusion. They will consult diverse sources of information and consider a variety of positions before making a judgment.

Julian Meltzoff’s Critical Thinking About Research: Psychology and Related Fields is organized into two parts. The first gives students an excellent introduction to the scientific method. Each step of experimental design, from the formulation of the hypothesis through data analysis and interpretation, is carefully and clearly explained. Research ethics are also discussed. The second part presents a series of fictitious
journal articles that challenge students to apply their knowledge. Each article contains built-in flaws and includes commentary that identifies the errors that may have slipped by the reader. The book truly assists students in becoming informed and critical consumers of research.

James Bell’s *Evaluating Psychological Information: Sharpening Your Critical Thinking Skills* teaches students to evaluate psychological information from various secondary sources and to sift reliable evidence from propaganda. After explaining what is involved in critical thinking, Bell presents a four-step procedure for evaluating psychological claims. Designed as a supplement for general psychology, each chapter opens with critical thinking questions that guide and focus learning. This volume has an accompanying instructor’s manual that reviews the literature on critical thinking, includes answers for exercises, and contains exercises for additional practice.

Donald H. McBurney’s *How to Think Like a Psychologist: Critical Thinking in Psychology* is a very useful supplement to the Myers text. It encourages critical thinking by holding widely held beliefs up to scientific scrutiny. Using a question-and-answer format, it deals with many of the common questions students bring to introductory psychology. For example: How do you explain déjà vu? Isn’t psychology mostly common sense? Can you prove there is no ESP? Can we hear satanic messages in music that is played backward? Topics are organized according to the outline of the standard introductory psychology text.

D. Alan Bensley’s *Critical Thinking in Psychology: A Unified Skills Approach* illustrates the need for critical thinking in addressing questions such as the following: “Are people basically selfish?” “Can psychotherapists help people recover memories of sexual abuse that they have not recalled for decades?” “Can the moon cause people to commit crimes?” After addressing the nature and importance of critical thinking, Bensley argues that the process of drawing sound conclusions involves a variety of skills, including analytical and deductive reasoning as well as the careful formulation and testing of hypotheses. Specific chapters in Bensley’s book fit the organization of a standard introductory psychology text. Questions of ethics penetrate the book, including how we test people, the problem of stereotyping, and the potential of harm to victims and those accused of sexual abuse in the repressed memory controversy. Each chapter opens with learning objectives, an outline, and “What do you think?” questions.

David A. Levy’s *Tools of Critical Thinking* is designed to promote students’ metathinking, that is, their thinking about thinking. Its brief chapters are devoted to many of the specific thinking errors discussed in the text, including the hindsight bias discussed in this chapter. The book contains many engaging exercises that challenge readers to improve their own strategies for inquiry and problem solving. Levy also presents the following definition of critical thinking that you could read to the class as an extension of the text discussion.

Critical thinking is an active and systematic strategy to examine, evaluate, and understand events, solve problems, and make decisions on the basis of sound reasoning and valid evidence. More specifically, critical thinking involves: maintaining an attitude that is both open-minded and skeptical; recognizing the distinction between facts and theories; striving for factual accuracy and logical consistency; objectively gathering, weighing, and synthesizing information; forming reasonable inferences, judgments, and conclusions; identifying and questioning underlying assumptions and beliefs; discerning hidden or implicit values; perceiving similarities and differences between phenomena; understanding causal relationships; reducing logical flaws and personal biases, such as avoiding oversimplifications and overgeneralizations; developing a tolerance for uncertainty and ambiguity; exploring alternative perspectives and explanations; and searching for creative solutions.

Robyn M. Dawes’ *Everyday Irrationality* highlights the limits of human intuition. Subtitled “How pseudoscientists, lunatics, and the rest of us systematically fail to think rationally,” the book defines irrationality as “adhering to beliefs that are inherently self-contradictory, not just incorrect, self-defeating, or the basis of poor decisions.” Dawes considers both the basis for irrational conclusions and the consequences of such conclusions. After considering the fundamental principles of probabilistic judgments, he focuses on specific types of irrationality—the subset fallacy, irrefutability, and the availability biases. He explains how we often substitute a good story or pure associations for a comparative (“outside”) analysis. Both produce an illusion of understanding. Although much everyday judgment, unsupported professional claims, and even social policy are based on irrational thinking, Dawes argues that we are not slaves to our desires and attitudes. Indeed, “we have the competence to be knowledgeable and rational, especially when we interact freely with each other.”

Scott Lilienfeld and his colleagues provide a large collection of useful resources for teaching courses in the science and pseudoscience of psychology. In an effort to promote critical thinking, they provide a model syllabus, primary and secondary texts, useful educational videos, and Web sites that offer critical evaluations of pseudoscientific claims.


C. The Scientific Method (pp. 24–26)

PsychSim 5: What’s Wrong With This Study?
This activity explains some of the major pitfalls in designing a research study. The student reviews the basic methodology used in psychological research, practices applying research methodology to new situations, and considers specific pitfalls that could reduce the value of the research findings.

Classroom Exercise: Astrology and the Scientific Method
Roger Ward and Anthony Grasha provide an excellent classroom exercise for introducing the scientific method. Begin by asking students what they know about astrology and whether they know much about their zodiac sign (the list below will help those who do not even know their sign). Have students indicate by a show of hands whether they chose the correct profile. Note that birthdate or zodiac sign is the independent variable and choice of personality profile is the dependent variable. If the hypothesis is correct, the number of correct matches should exceed the number of incorrect matches. Ideally, there would be no incorrect responses.

You may go on to introduce the concepts of chance responding, probability, and statistical significance. For example, on the basis of chance alone, 16.6 percent of the responses should be correct (given that everyone had a 1 in 6 chance of selecting a correct profile). Note that having all 12 profiles (instead of 6) would make it harder to select the correct description by mere chance, and that statistical procedures enable researchers to determine whether differences are due to chance.

You might want to discuss additional complications in interpreting the research data. For example, can people accurately select personality profiles for themselves? Psychologists design objective personality inventories to assess differences among people. Do some individuals select a given personality profile because it is more socially desirable or because they are familiar with astrology and know what profile they should pick? You may also want to indicate that if certain descriptions are more popular and if more participants happen to be born under those zodiac signs, an incorrect conclusion about the validity of astrology could be drawn. This problem can be handled by total random selection of participants or by randomly selecting an equal number of people with each zodiac sign.

E Aries (March 21–April 19)
B Taurus (April 20–May 20)
C Gemini (May 21–June 21)
A Cancer (June 22–July 22)
F Leo (July 23–August 22)
D Virgo (August 23–September 22)
K Libra (September 23–October 22)
H Scorpio (October 23–November 21)
I Sagittarius (November 22–December 21)
L Capricorn (December 22–January 19)
J Aquarius (January 20–February 18)
G Pisces (February 19–March 20)
For students interested in astrology you might suggest that they follow their horoscope in the daily newspaper for a month. Each day they should cut it out and paste it in a notebook; on the following day they should rate the prediction on a scale from 1 (didn’t come true at all) to 5 (very accurate). They should also explain their rating. At the end of the month, they should review the accuracy of their ratings. This strategy will help to defeat the confirmation bias that often contributes to people’s belief in astrology.


Student Project/Classroom Exercise: Testing Proverbs Having students test proverbs provides an interesting way for them to apply the scientific method. They can identify the theory that underlies the proverb or rule of thumb, generate a testable hypothesis, and suggest a possible design (descriptive, correlational, or experimental) to test the hypothesis. If the design is experimental, they can identify independent and dependent variables and specify operational definitions. Nigel Turner suggests using small groups and having students think up their own proverb. For example, the familiar saying “The grass is always greener on the other side of the street” implies that people envy what others have. A simple approach that students might suggest is to randomly distribute small toys to groups of children, then have each child rate the desirability of all the objects—both their own and those given to the other children. Have each small group report to the whole class on their proverb and design for testing it. You might also provide individual students or small groups with the same proverb or rule of thumb and compare how each approaches it. Stephen Wurst suggests Tom Parker’s Never Trust a Calm Dog (HarperCollins, 1990) as a useful resource; Parker’s Rules of Thumb 2 (Houghton Mifflin, 1987) is also available. Here are just a few examples from Parker’s books.

“The shorter a word, the more meanings it has.”

“Don’t change your first guess on a multiple-choice test when checking over your answers.”


III. Description (pp. 26–30)

A. The Case Study (pp. 26–27)

Lecture/Discussion Topic: Case Studies

Mark Leary provides an excellent review of the uses and limitations of case studies that supplements the text’s brief coverage. Extending the text definition, Leary defines a case study as a detailed study of a single individual, group, or event.

Although case studies of individuals are most common, researchers may also perform case studies of groups. For example, as discussed in Chapter 18, social psychologist Irving Janis studied several political and military decision-making groups in an effort to understand why groups sometimes make bad decisions. Educational psychologists sometimes study exemplary schools in an attempt to understand why particular schools are so good. Ethologists have conducted case studies of troupes of baboons, chimpanzees, gorillas, and other nonhuman animals.

Typically, the researcher produces a narrative description of the person, group, or event. Objective measures of personality or behavior may be supplemented by the researcher’s subjective impressions.

Leary identifies four uses of the case study in behavioral research. First, as the text suggests, a case study may be used as a source of insights and ideas, particularly in the early stages of investigating a specific topic. For example, Freud’s theory of psychoanalysis emerged from his case studies of therapy clients. Piaget’s theory of cognitive development arose from case studies of his own children. Janis’ case studies of decision-making groups set the stage for his theory of groupthink, and Festinger’s case study of groups that predicted the end of the world led to his influential theory of cognitive dissonance.

Second, case studies may be used to describe particularly rare phenomena. The study of presidential assassins is necessarily limited to case studies of a few people who have killed or tried to kill U.S. presidents. Investigations of mass murders also are limited to a case study approach. Luria used a case study to describe another rare phenomenon—a man who had nearly perfect memory. Neuropsychologists sometimes conduct case studies of people whose nervous systems...
have been damaged because of unusual injury or disease. Oliver Sacks’ *The Man Who Mistook His Wife for a Hat* provides a wonderful example.

Third, case studies in the form of *psychobiographies* involve the application of psychological concepts and theories in an effort to understand the lives of famous people, such as da Vinci, Martin Luther, Mahatma Gandhi, Nathaniel Hawthorne, and Richard Nixon. Sometimes the investigator attempts to explain the person’s entire life; in other cases, he or she studies only specific aspects of the person’s behavior. Obviously, such reports involve post hoc explanations.

Finally, case studies provide illustrative anecdotes. Researchers and teachers often use case studies to illustrate general principles to other researchers and to students. Leary notes that scientists must often convince others of the usefulness and importance of their findings. Although never providing proof of an assertion, case studies can be used to provide concrete examples of abstract concepts and processes.

There are at least two important limitations of case studies. First, they are virtually useless in providing evidence to test behavioral theories or treatments. The lives and events studied occur in uncontrolled fashion and without comparison information. No matter how reasonable the investigator’s explanations, alternative explanations cannot be ruled out. Second, most case studies rely on the observations of a single investigator. Thus, we often have no way of assessing the reliability or validity of the researcher’s observations or interpretations. Because the researcher may have a vested interest in the outcome of the study (e.g., whether a therapy works), one must always be concerned about self-fulfilling prophecies and demand characteristics.


**B. The Survey (pp. 27–29)**

*Classroom Exercise: Saying Versus Doing*

One limitation of survey research is that what people say is often very different from what they do. Wilbur Scoville observes that many attitude surveys and opinion polls ask respondents for their intentions, and intentions are not always translated into action. To prove this point, Scoville suggests a simple classroom demonstration.

Begin by asking if any students have ever eaten such exotic foods as chocolate-covered ants, snails, or fried grubs. Ask a few of those who did not raise their hands, “Would you consider eating a chocolate-covered ant?” If necessary, attach a price (“Well, would you for a dollar?”).

When the bargaining is complete, you will have identified three or four students who have publicly agreed to eat a chocolate-covered ant (or similar food) either for free or for some nominal sum. At this point, reach into your briefcase and pull out the nicely packaged delicacy (available from the gourmet food section of large, metropolitan department stores). If you have selected your participants carefully, most of them will turn you down when it comes time to follow through (this preserves supplies). You are now able to introduce a meaningful discussion of the “What would you do if . . . ?” question, which is the essence of many attitude surveys and opinion polls. Scoville notes that whether the students actually eat the delicacy is not important, since the project lends itself to good discussion in either case.


*Classroom Exercise: The Wording of Survey Questions*

Handouts 1–5 provides a simple but powerful demonstration of how responses to a survey can be influenced by the wording of the questions. After making half as many copies as you have students, cut the sheets in half, and distribute the top half to the left side of your class, the bottom half to the right side. Compared to those who are provided “anchors” of 500 miles and two million people, those given 3000-mile and 100 million people anchors will give higher estimates. Collect the responses and calculate the mean for each group, or, more simply, by a show of hands ask each group provided a different anchor whether their own estimate was greater than 1500 miles or 30 million people. A majority of those given higher anchors will raise their hands but a minority of those given smaller anchors will do so. The Mississippi River is actually 2348 miles and the population of Argentina is 36 million.

Laura Madson designed Handouts 1–6a and b to initiate a more detailed class discussion of the importance of the proper wording of survey questions. At the end of the class hour before discussing wording effects, randomly distribute a copy of Handout 1–6a or b to each student. Collect the completed surveys as students leave class, and between classes calculate the mean response for each item. For the next class period, prepare a PowerPoint or an overhead of the questions, showing the mean score for each item (alternatively, distribute copies of both handouts to each student with the mean score placed in the blank before each item). Percentages, of course, are entered for the last item. Scores for the different versions of each item are likely to be quite different.

Madson suggests class discussion focus on a number of issues, including the following: (a) Will respondents agree on what a term means? (b) Does the item make implicit assumptions about the respondents? (c) Does each statement measure the concept of interest?
(d) Will the researcher be able to accurately interpret the data?

For example, “sexual freedom” in the (b) version of item 5 may mean the freedom to be sexually active, to choose one’s sexual partners, to choose the timing and setting of sexual activity, or the freedom to be sexually active with more than one partner. Other terms that may have different meanings include “protection,” “have sex,” and “committed relationship.” These alternative meanings could affect a person’s responses and make it difficult for the investigator to interpret results. Items 3 and 7 make implicit assumptions about respondents. How are students for whom these assumptions are incorrect likely to answer, and how should their responses be interpreted? Item 7 on both forms of the survey raises an additional conceptual problem, namely, whether the item really assesses what is intended. It probably is attempting to assess frequency of condom use. Similarly, item 4 should probably be rephrased to ask respondents how often they lie rather than assessing agreement with statements about lying. Item 8 illustrates the difficulty of imprecise statements as well as the effect of different scales.

In some cases, survey respondents may be ignorant of the words used. For example, a survey of 1255 adults by New York’s American Museum of Natural History and Louis Harris found that 77 percent were interested in plants and trees but only 39 percent were interested in botany. A total of 48 percent were interested in fossils but only 39 percent were interested in paleontology. Of the total sample, only 42 percent were interested in rocks and minerals, but 53 percent were interested in geology. Although respondents may be totally ignorant of an issue, they often do not want to admit it. In one famous study, a third of the people surveyed offered an opinion about a nonexistent “Public Affairs Act.” Many respondents tell pollsters only what they think the dominant media want to hear. Their tendency to give acceptable rather than honest responses is also evident in how the gender and race of the interviewer influence results.

When interviewed by whites, 62 percent of white respondents agree that “The problems faced by blacks were brought on by blacks themselves.” When interviewed by blacks, only 46 percent agree. When interviewed by a man, 64 percent of women agree that “abortion is a private matter that should be left to the woman to decide without government interference.” When interviewed by a woman, 84 percent of women respondents agree.

In other cases, questions are poorly framed and elicit confusion. For example, ABC News Nightline once asked, “Do you think the United States should or should not end the trade embargo and allow U.S. companies to do business in Cuba and Cuban companies to do business here?” More startling were the survey results of 1992 that one out of five Americans doubted that the Holocaust had occurred, while another 12 percent said they were not sure. However, the question posed by the respected research firm Roper Starch Worldwide and on which these results were based read: “As you know, the term Holocaust usually refers to the killing of millions of Jews in Nazi death camps during World War II. Does it seem possible or does it seem impossible to you that the Nazi extermination of the Jews never happened?” Researchers for Gallup, a Roper competitor, criticized the question’s wording, arguing that it contained a double negative (“. . . does it seem impossible . . . never happened”) and required respondents to hold quite a bit in their heads. When a Gallup poll asked respondents the much simpler, “Do you doubt that the Holocaust happened, or not?” 9 percent said they doubted the truth of the holocaust, and another 4 percent said they were unsure.

The wording of a question is particularly important on emotionally charged issues. Shortly after the September 11, 2001 attacks, pollster Stanley Greenberg asked, “Do you think the United States should increase spending on foreign aid, decrease spending on foreign aid, or keep it about the same?” A total of 14 percent favored an increase, 32 percent said it should be decreased, and 49 percent thought that it should remain the same. However, when the interviewer substituted “humanitarian aid” for “foreign aid,” the numbers shifted noticeably. A higher percentage favored an increase and a lower percentage favored a decrease. When the interviewer asked about funding for ten specific foreign aid initiatives, respondents favored increased spending in six initiatives and keeping the spending the same in the other four. For example, when a New York Times/CBS News poll asked people if they favored an amendment “prohibiting abortions,” a majority opposed it. But when asked whether they favored “protecting the life of the unborn child,” some 20 percent switched sides. A Gallup poll found that 91 percent favored a “waiting period and background check before guns can be sold.” A Wirthlin Poll for the National Rifle Association reported that only 37 percent favor a “national gun-registration program costing about 20 percent of all dollars now spent on crime control.” In the 1940s, a majority of Americans thought that the United States should “not allow” public speeches against democracy, but only a minority thought we should “forbid” such public speeches. Differences have also been found between “not allowing” and “forbidding” peep shows, X-rated films, and the use of salt to melt snow on highways.

Responses are also influenced by the range of response options. In December 2003, a New York Times/CBS poll reported that 55 percent of those asked favored a constitutional amendment banning same-sex marriage. In contrast, a Pew Research Center poll taken two months earlier had reported that only 10 percent of
try be percent said it should stay as it is. But when other er, 36 percent said it should be more difficult, and 41 percent obtain, more difficult to obtain, were asked, “Should divorce in this country be influence responses. In one national poll, respondents were asked, “Which of the following do you think is the most important problem facing this country today,” a total of 32 percent identified the quality of public education. Similarly, when Americans in 1987 were simply asked to name “the most important problem facing this country today,” only 1 percent mentioned the quality of public education. However, when asked “Which of the following do you think is the most important problem facing this country today—the energy shortage, the quality of public schools, legalized abortion, or pollution—or, if you prefer, you may name a different problem as most important,” a total of 32 percent identified the quality of public education.

Finally, the order of questions and alternatives can influence responses. In one national poll, respondents were asked, “Should divorce in this country be easier to obtain, more difficult to obtain, or stay as it is now?” In response, 23 percent said divorce should be made easier, 36 percent said it should be more difficult, and 41 percent said it should stay as it is. But when other respondents were asked, “Should divorce in this country be easier to obtain, stay as it is now, or be more difficult to obtain,” 26 percent said it should be easier, 29 percent preferred the status quo, and 46 percent said it should be more difficult. Similarly, ask whether the country has health care problems or a health care crisis and 55 percent of U.S. citizens say “crisis.” Ask them if the country has a health care crisis or health care problems and 61 percent say “problems.” If you pose the choice, “Would you say that traffic contributes more or less to air pollution than industry,” 45 percent say traffic contributes more and 32 percent say industry does. Reverse the question—“Would you say that industry contributes more or less to air pollution than traffic?”—and only 24 percent say traffic contributes more and 57 percent say industry does. Asked to compare the relative excitement of soccer to tennis, 65 percent of respondents say soccer is more exciting. Ask them to compare the relative excitement of soccer to tennis, and 77 percent say tennis is more exciting.

The Statistical Assessment Service nominated the following 1937 British Gallup Poll question as a leading candidate for the “Worst Poll Question of All Time”: “Are you in favor of direct retaliatory measures against Franco’s piracy?” In the space of only eleven words, this question, suggests the Statistical Assessment Service, broke five important rules of question design:

1. It is not balanced. Questions should be even-handed so that respondents realize there is no preferred answer. Thus, many questions begin with, “Do you agree or disagree” or, in this case, “Do you favor or oppose…?”
2. It assumes knowledge. Who is “Franco”?
3. It does not use everyday language. What are “retaliatory measures”?
4. It employs a pejorative (“piracy”).
5. It is vague. Retaliatory measures could range from dressing down the Ambassador to declaring war.

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4. It employs a pejorative (“piracy”).
5. It is vague. Retaliatory measures could range from dressing down the Ambassador to declaring war.


Classroom Exercise: The False Consensus Effect
Mary E. Kite provides a brief yet effective classroom demonstration of the false consensus effect. Present students with an opinion—for example, “George W. Bush is a good president,” or “I like David Letterman,” and ask them to indicate their degree of agreement on a scale ranging from (1) strongly agree to (5) strongly disagree. (To simplify, you could use a yes-no format.) Also ask students to estimate the percentage of people in the class that they believe share their opinion. By a show of hands, ask how many selected each response and record the number on the board. After computing
the percentage of students choosing each option, have students indicate by a show of hands whether they overestimated the number of people in agreement with them. Kite reports that in her classes at least 60 percent of students overestimated the commonality of their opinions.

Note that research indicates that the false consensus effect seems to hold across reference groups (for example, friends in college versus all college students in general) and issues (for example, preferred type of bread or preferred presidential candidate). However, the strongest false consensus effects emerge with factual information or political expectations (for example, future use of nuclear weapons, outcome of presidential elections). Some have suggested that the bias may reflect people’s tendency to overestimate the probability of events easily brought to mind (the availability heuristic). Ask students what might be some costs and benefits of a false consensus for individuals and society. Finally, ask them whether having others agree with us makes our opinions “correct.”


**Classroom Exercise: Conducting a National Survey**
A random sample of 1500 people can accurately estimate the responses of 200 million people. A memorable way of making this point is to simulate a national survey in the classroom (see also text pp. 28–29).

1. Obtain a wide-mouthed gallon jug. Perhaps your campus food service can provide one.
2. Purchase a large quantity of small white beans and identical-sized colored beans. If colored beans are not available, you can stain white beans with food coloring. (But if you have to color some white beans, be sure to soak and dry even the white, so they are indeed the same size.)
3. Place a large known quantity of beans in the jug—at least 10,000 beans. This will be the population and can be considered, for all practical purposes, as infinite. Since the white and colored beans are identical in size, you need only measure a known proportion of each—for example, 60 percent white (6000 beans), 40 percent green (4000 beans). Mix the beans thoroughly.
4. Have each student act as a survey-taker, removing a small handful from the jug. Suggest, “We’re surveying voter preferences for the next presidential election. The white beans represent supporters of the Democratic candidate, green beans support the Republican.” If there are 30 people in the class, have each person drop 50 beans randomly from a closed hand, counting the two colors.
5. Tabulate the results. Tallying 15 groups of 100 beans will demonstrate a 95 percent confidence level of about ±10 percent about the true population mean. Clustering those into three groups of 500 will demonstrate that the margin of error is reduced to about ±5 percent. Chances are 95 percent that a population estimate based on the total sample of 1500 will be within ±3 percent.
6. Emphasize that the sampling principles demonstrated are the same as those involved in large national surveys and that it makes little difference whether the population is 10,000 or 100 million.


**Classroom Exercise: Choosing a Random Sample**
Richard Schaeffer and his colleagues provide an excellent classroom exercise that demonstrates not only the importance of using random samples but also how such samples are typically selected using a table of random numbers. The exercise also illustrates the distinction between a population and a sample as well as the limits of human intuition.

Distribute a copy of Handouts 1–7a and b (they can be placed on opposite sides of the same sheet) with 1–7b on top. Tell students not to look at 1–7a until you tell them to turn the sheet over. When everyone has a copy, tell them to turn the page over and look at the total population of rectangles for just a few seconds. Have each student write down his or her best guess of the average area of the rectangles on the sheet. (The unit of measure is a square; thus, rectangle 33 has area $4 \times 3 = 12$.) Then, have each student select five rectangles (rectangles are numbered to the lower right) that they believe are representative of the population (for example, rectangles 7, 15, 29, 87, and 89). Have them calculate the average of the five areas and compare it to their guess $(12 + 9 + 10 + 8 + 12 = 51; \text{mean} = 10.2)$. Ask if they were close. Generally, they will be.

Ask students to report their initial guess and the average area of their sample. As they call out their answers, write them on the chalkboard in two separate columns. Use a calculator to compute the mean of the guesses and the mean area of the samples for the entire class. (Both the mean of the initial guesses and that of the samples will probably be about 11.00.)

Next, have students choose a random sample using 1–6b, the table of random numbers. The best way to pick from the table is to close their eyes and point to a specific spot on the table, then open their eyes and use the number they are pointing to (they must use the first two digits) to represent the first rectangle in their sample. They should use the subsequent eight digits (read-
ing either across or down) to represent the other four rectangles in the sample. (Spaces on the table can be ignored; they simply make the table more readable). In addition, number 00 on the table would specify rectangle 100.) Have students use these numbers to calculate the average area of their five rectangles. Finally, have students report their sample average and calculate the mean of the samples. It will be significantly smaller than the earlier means and very close to the true mean for the entire population, which is 7.42.

In conclusion, you might ask students why the area of the sample they chose was so much larger than that of the random sample. Clearly, units having a larger area are more vivid and salient. Our intuitions underestimate the number of units that are composed of a single square.


**Lecture/Discussion Topic: Predicting U.S. Presidential Elections**

Obtaining a representative sample of even a well-defined population may not be easy. The challenge of selecting a representative sample is apparent in efforts to predict the outcome of U.S. presidential elections every four years.

To predict the outcome, one needs, of course, a representative sample of all adult Americans who will actually vote in the election, not of all adult Americans. According to the 2000 census and election results, only 70 percent of those eligible to register voted. Thus an election poll that draws from a pool of registered voters will be more accurate than one drawing from all those who are eligible to register. Still, only 86 percent of registered voters actually voted. In short, of all those eligible to register, only 60 percent voted. Furthermore, one cannot just take the voter’s word that he or she will vote. About a third of those who say they will vote never show up. Voting, like charitable giving, is socially desirable, something people tend to overstate.

Another complication in obtaining a representative sample of voters is that all major polling organizations use the telephone to contact respondents. This means those who don’t have a phone are automatically eliminated. Statistically, very few people don’t have phones, and so this may no longer have a major impact. However, in the most recent elections, those who use only cell phones and thus do not have landlines were likely eliminated—a factor that could potentially affect polling outcomes.

A more persistent problem has been the time of day that calls are made. Shortly after the 2004 New Hampshire primary, the *Washington Post* criticized polling giant John Zogby for relying on daytime polling. Although this allowed him to finish polls more quickly and grab the headlines, it may also mean that his samples contained a disproportionate number of retirees and housewives.

Almost all polls, including those predicting elections, overrepresent friendly or social people whose disposition makes them less likely to hang up the phone. Refusal rate to participate in a phone survey in the United States is sometimes as high as 60 to 80 percent. If those who say “no” are different in any way from those who agree to talk, the sample is biased.

Exit polls of those who actually vote demonstrate how fatal this last bias can be. Although exit pollsters face none of the usual polling problems in obtaining a representative sample (e.g., using landlines, contacting nonvoters, and having to call at certain times of day), the fact that those voting for a particular candidate may be more willing to talk can skew results. Thus, while early exit polls in the 2004 election suggested that John Kerry would replace George Bush as the next president, they were quickly proven wrong. Among the factors that contributed to this failure was the fact that younger voters who were more likely to vote for Kerry were also more willing to talk to the similarly young pollsters. In short, even exit polls face the challenge of obtaining a truly representative sample of all voters.


**Lecture/Discussion Topic: Survey Research and Random Samples**

After you have discussed the characteristics of a good survey, just for fun, present some findings from Mel Poretz and Barry Sinrod’s *The First Really Important Survey of American Habits*. The survey asked respondents about their eating, sleeping, and dressing habits, as well as for information about their special abilities and eccentricities. Some findings: A total of 68 percent roll toilet paper over the spool, 79 percent squeeze the toothpaste from the top, 7 percent look behind the shower curtain when using someone else’s bathroom, and 80 percent eat corn on the cob in circles rather than from side to side. Before students decide that they should change their habits, they should recognize that the results are based on responses from a sample of only 7000 out of 25,000 who received questionnaires. Bernice Kanner’s recent *Are You Normal?* also provides some entertaining survey data including the fact that 50 percent eat their Oreos whole, 18 twist the halves apart, and 15 percent dunk them. The rest smash them or add
them to another dessert. Ten percent have seen a ghost, 27 percent skip ahead to find out what will happen in a book, and 7 percent have flossed their teeth with a hair. However, Kanner gives no information on how these results were obtained. The moral: Before believing survey results, consider the sample. You might also check Kanner’s more recent Are You Normal About Love, Sex, and Relationships? for interesting survey results—e.g., 6 percent of marriage proposals are made by phone, 67 percent of women consider themselves romantic, and 58 percent of men and women believe that you should follow your heart rather than your head in choosing a partner.

Phone-in surveys may be similarly biased. When television stations conduct such surveys, asking viewers to call one number to register a “yes” vote and another for “no,” only those who feel strongly enough to invest the 50 cents or $1.00 charges for each call are likely to phone—not a representative sample.

Obtaining random samples for any purpose is difficult. The government has no more success than private pollsters. The 1970 draft lottery to determine the order of induction into military service was almost certainly unfair. The 31 capsules for January birthdays were placed in the bin first, then the 29 February capsules, and so forth until finally December’s 31 were included. Apparently, there was not enough turning of the bin, for December dates were disproportionately represented among the early draws, whereas dates from the first month of the year came up nearer the end significantly more often than chance would dictate.


C. Naturalistic Observation (pp. 29–30)

Student Project/Classroom Exercise: Naturalistic Observation in the Dining Hall

As the text indicates, one descriptive research method involves watching and recording the behavior of organisms in their natural environment. This can range from watching chimpanzee societies in the jungle to recording students’ self-seating patterns in the lunchrooms of multiracial schools. Nancy Koschmann and Richard Wesp suggest using your college dining facility as an introductory psychology laboratory. This environment provides a rich source of interesting behavior to study and it requires no financial support.

Naturalistic observation does not explain behavior but rather describes it. Give your students the simple instruction to observe the behavior of others during mealtime in the cafeteria. Although you might suggest some behaviors, such as seat selection or food choices, strongly encourage students to come up with their own behavior to investigate. In addition, they should record their observations, maintain confidentiality, and explain what they are doing if asked. Have them report their findings at the next scheduled class.

Koschmann and Wesp report that these limited instructions led to a wide variety of reported observations, for example, how people chose a seat, ate, socialized, or departed. Taking a quantitative approach, some counted drinks taken or return trips for food. Others described emotional responses to such things as finding a seat or meeting a friend. Still others made comparisons between groups based on such characteristics as gender, social status, or college class. The reports naturally lead to a consideration of such important observational skills as operationally defining variables, sampling, and descriptive statistics.

The nature of students’ reports (e.g., comparisons between groups based on gender, social status, or college class) may naturally take you to the next strategy—correlational research. Explain that describing behavior is the first step in predicting it. To demonstrate prediction, have students form small groups of 4 to 6 students, direct them to observe two related behaviors in the dining hall (e.g., the amount of food taken and distance from the food line or the number of napkins taken and how many items were unused). Encourage the groups to select variables about which they can form a hypothesis about their relationship. Explain that the observable behaviors must be quantifiable (e.g., the number of tables away from the food line would be a measure of distance). Give the groups 15 minutes to form an action plan.

Alternatively, you can assign larger groups or even your entire class to investigate particular relationships, say, the amount of food taken from a salad bar as related to age, class in school, sex, and weekly allowance. My class decided to use measured height (in millimeters) of the salad taken and asked diners to fill out a short questionnaire on demographic variables. The student researchers informed diners of the purpose of the study, told them their names would not be used, and made clear they had the choice not to participate. More simply, you can have students use a less obtrusive approach, for example, comparing estimates of amount of salad taken with estimates of weight, height, and age.

Again have students report their findings at the
Performance

Classroom Exercise: Correlations and Predicting Exam Performance

IV. Correlation

need for replication. cial challenges of field experiments, and, of course, the importance of statistics in assessing the results, the spe-

bal interactions. In each case, students reported their experiment (e.g., independent and dependent variables), hypothesis, identified the important elements in their experiment, and calculate the correlation coefficient. This exercise will clearly demonstrate that correlation does not mean causation. It will also make evident that prediction can be improved with more observations. That is, correlation should gradually increase as more test scores are averaged together to predict exam performance. (An alternative to using scores from the previous semester is to exam-

Wallace suggests correlating each test, as well as the average of the first two tests, the average of the first three tests, etc., with final exam scores. Most statistical software packages will generate the scatterplots and the correlation coefficients. This exercise will clearly demonstrate that correlation does not mean causation. It will also make evident that prediction can be improved with more observations. That is, correlation should gradually increase as more test scores are averaged together to predict exam performance. (An alternative to using scores from the previous semester is to examine the correlations between scores on two or more tests taken by your present class.)


Classroom Exercise: Correlating Test-Taking Time and Performance

Do those who take more time to complete a test perform better or worse than those taking less time? The answer is certain to interest most students. At the same time, as Steven Davis and Cathy Grover suggest, you can illustrate correlation.

Before raising the question in class, collect some relevant data. By distributing your next test face-down and asking students to wait for your signal to begin, you can note the common starting time. Then, as each test is turned in, record the time of completion at the top. Subtracting the starting time from the completion time will give a measure of elapsed time, which can then be correlated with test grade. Create a scatterplot and calculate the correlation coefficient.

When you raise the critical question in class, students are likely to express strong opinions on both sides of the issue. After allowing ample time for discussion, present your data. Failure to find a significant correlation between test-taking time and performance should not surprise you, because most of the research has not been able to find one either. If time allows, calculate the correlation for men and women separately; Davis and Grover indicate that they have frequently found that women’s, but not men’s, scores show a negative relationship with test-taking time.


Depending on their subject, students may need to obtain prior approval of dining hall staff before they conduct their experiment. Koschmann and Wesp report that their students conducted simple studies such as handing out napkins to assess how napkin availability increased usage and introducing a new friend to a table of diners to evaluate the influence of strangers on verbal interactions. In each case, students reported their hypothesis, identified the important elements in their experiment (e.g., independent and dependent variables), and presented their results. In class you can discuss the importance of statistics in assessing the results, the special challenges of field experiments, and, of course, the need for replication.

Next class period. If you use small groups help each group to plot their results on a scatterplot. With large groups, each student may conduct one observation and plot his or her results on a chalkboard scatterplot. Calculate the correlation coefficient in class or between class periods.

Dining room experiments may represent a challenge but, as Koschmann and Wesp illustrate, they can be done. For example, you might tell students to consider a behavior that occurs during mealtime and to identify an environmental variable that might change that behavior. Give the small groups an opportunity to form hypotheses. Then instruct them to observe and record the behavior they identified, change the environment, and observe and record changes in the behavior. To get them started, you can give examples of manipulations—for instance, to study modeling, the student might measure the frequency of tablemates looking toward another table, begin to stare at the table, and record the frequency of other tablemates modeling his or her staring behavior.

Depending on their subject, students may need to obtain prior approval of dining hall staff before they conduct their experiment. Koschmann and Wesp report that their students conducted simple studies such as handing out napkins to assess how napkin availability increased usage and introducing a new friend to a table of diners to evaluate the influence of strangers on verbal interactions. In each case, students reported their hypothesis, identified the important elements in their experiment (e.g., independent and dependent variables), and presented their results. In class you can discuss the importance of statistics in assessing the results, the special challenges of field experiments, and, of course, the need for replication.


IV. Correlation (pp. 30–36)

PsychSim 5: Statistics: Correlation

This program demonstrates the meaning and use of scatterplots and the way correlations are calculated.

Classroom Exercise: Correlations and Predicting Exam Performance

To illustrate correlation, James Wallace asks his class this question: “How closely can I predict your performance on the final exam from your earlier test scores?” Although computations can be done by hand, it is more efficient to answer the question with the computer. Use scores from the previous semester to create a data file.
A. Correlation and Causation (pp. 32–33)

Lecture/Discussion Topic: Understanding Correlation

The tendency to interpret correlations in terms of cause and effect is a common error. Giving students some practice in interpreting specific examples may make them less prone to this bias.

1. Hippocrates’ delightful Good News Survey (GNS) was designed to illustrate errors that can be hidden in seemingly sound scientific studies. The survey found that people who often ate Frosted Flakes as children had half the cancer rate of those who never ate the cereal. Conversely, those who often ate oatmeal as children were four times more likely to develop cancer than those who did not. Does this mean that Frosted Flakes prevents cancer while oatmeal causes it? Ask your students to suggest explanations for these correlations. The answer? Cancer tends to be a disease of later life. Those who ate Frosted Flakes are younger. In fact, the cereal was not around when older respondents were children, and so they are much more likely to have eaten oatmeal. The GNS finding that children who took vitamins were more than twice as likely to go on to use marijuana and cocaine was also likely due to these respondents being younger than average. Finally, the GNS revealed that people who had had routine physicals in the previous 3 years were twice as likely to report high blood pressure and cholesterol levels. Do physical exams cause health problems? No, the survey researchers suggest that the unmasking bias is probably operating, with those having had physicals simply more likely to know they have a problem.

2. Neil Salkind poses this interesting correlation for student interpretation. A local police chief in a small Midwestern town finds that as ice cream consumption increases, the crime rates increases. As people eat less ice cream, the crime rate decreases. What explains this relationship? Is it a causal connection or is there something these two variables have in common? Both ice cream consumption and crime rate are related to a third variable: outside temperature. When it is warm outside, as it is in summer, people enjoy the treat of ice cream and more crimes are committed, because it stays light longer, people are outdoors, and windows are kept open. During the long, dark winter months, people eat less ice cream and fewer crimes are committed.

3. Scientists have linked television-watching with childhood obesity. In fact, the degree of obesity rises 2 percent for each hour of television viewed per week by those aged 12 to 17, according to a study in the Journal of the American Academy of Pediatrics. One explanation is that TV watching results in less exercise and more snacking (often on the high-calorie, low-nutrition foods pitched in commercials). Is that conclusion justified? What are some alternative explanations for the correlation? The causal relationship may be reversed. Obesity may lead children to prefer more sedentary activities, such as TV viewing. Or, some third factor may explain the relationship. For example, parents having little formal education may not emphasize good nutrition or good use of leisure time.

4. Children with high self-esteem also tend to have high academic achievement. Why is this? Some might argue that a healthy self-concept boosts school achievement. Others are convinced that high achievement produces a favorable self-image. Reports of a recent nationwide sample indicate neither is true. In other words, self-esteem and achievement are not causally connected. Rather, their correlation is due to their both being linked to intelligence and family social status. Remove the effect of these two variables, and the correlation between self-esteem and achievement evaporates.

5. In his best-selling book Innumeracy: Mathematical Illiteracy and Its Consequences, John Paulos gives several examples of how two variables may be correlated because of their relationship to a third factor. For instance, a positive correlation between milk consumption and incidence of cancer in various societies is probably explained by the relative wealth of these societies, bringing about both increased milk consumption and more cancer as a function of greater longevity. In the New Hebrides Islands, body lice were at one time thought to produce good health. When people became ill, their temperatures rose and caused the body lice to seek more hospitable abodes. Both the lice and good health departed with the onset of the fever. Similarly, the unexpected positive correlation between the quality of a state’s day care programs and the reported rate of child abuse is not causal but merely indicates that better supervision results in more consistent reporting of incidents.


Lecture/Discussion Topic: Misinterpreting Correlations

Keith Stanovich has identified two major classes of ambiguity in correlational research: the “directionality
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problem” and the “third variable possibility.” He illustrates each with a misinterpretation that had important consequences.

1. Directionality problem: Researchers have long known about the correlation between eye-movement patterns and reading ability: Poorer readers have more erratic patterns (moving the eyes from right to left and making more stops) per line of text. In the past, however, some educators concluded that “deficient oculomotor skills” caused reading problems and so developed “eye-movement training” programs as a corrective. Many school districts may still have “eye-movement trainers,” representing thousands of dollars of equipment, gathering dust in their storage basements. Careful research has indicated that the eye movement/reading ability correlation reflects a causal relationship that runs in the opposite direction. Slow word recognition and comprehension difficulty lead to erratic eye movements. When children are taught to recognize words efficiently and to comprehend better, their eye movements become smoother. Training children’s eye movements does nothing to enhance their reading comprehension.

2. Third variable possibility: In the early twentieth century, thousands of Americans in the South died from pellagra, a disease marked by dizziness, lethargy, running sores, and vomiting. Finding that families struck with the disease often had poor plumbing and sewage, many physicians concluded that pellagra was transmitted by poor sanitary conditions. In contrast, Surgeon General Joseph Goldberger thought that the illness was caused by an inadequate diet. He felt that the correlation between sewage conditions and pellagra did not reflect a causal relationship, but that the correlation arose because the economically disadvantaged were likely to have poor diets as well as poor plumbing.

How was the controversy resolved? The answer demonstrates the importance of the experimental method. To prove he was right, Goldberger not only had himself injected with the blood of a victim, he also actually ate the excrement of pellagra victims.

Finally he selected two patients—one with scaling sores and the other with diarrhea. He scraped the scales from the sores, mixed the scales with four cubic centimeters of urine from the same patients, added an equal amount of liquid feces, and rolled the mixture into little dough balls by the addition of four pinches of flour. The pills were taken voluntarily by him, by his assistants and by his wife. None of them came down with pellagra. To further make his case, Goldberger asked two groups from a Mississippi state prison farm to volunteer for an experiment. One group was given the high-carbohydrate, low-protein diet that Goldberger suspected to be the culprit, while the other group received a balanced diet. Within months, the former group was ravaged by pellagra, while the latter showed no signs of the disease.


Student Project: Evaluating Media Reports of Research

Having students evaluate popular reports of research findings gives them the opportunity to apply their understanding of scientific methodology and to improve their critical thinking. The following exercise provides practice in understanding the distinction between correlation and causation; have students do it individually, in small groups, or as an entire class.

Patricia Connor-Greene suggests using small groups of four or five to discuss Handout 1–8. It includes a brief report from USA Today and a short list of questions. Have the groups consider the report and address the questions (allow about 40 minutes), then reconvene the entire class to discuss the group responses. (It’s best to have each group select a recorder/reporter.)

Connor-Greene notes that students typically interpret the article as implying that male homosexuality is caused by smaller brain cell nuclei, pointing to the statements, “The debate over the roots of homosexuality has been going on a long time, but this finding ‘suggests a biological phenomenon’” and “It might explain ‘why male homosexuality is present in most human populations . . .’” Typically, however, students do recognize that this research is correlational. Discussing alternative interpretations (for example, sexual orientation could affect size of brain cell nuclei or the relationship could be caused by a third variable) helps students to appreciate the danger of confusing correlation and causation. Groups are likely to note two difficulties with the title of the article. First, it suggests that all cells are different in gay men, but the study refers only to brain cell nuclei. Second, the title also suggests that the gay men are the “different” ones, but the article reports gay men’s brain cell nuclei to be similar in size to those of women. Thus, the “different” ones are actually the heterosexual men. The quote from the news report that the study can “prove . . . being gay or lesbian is not a matter of choice” provides the opportunity to discuss the nature of scientific experimentation and the inappropriateness of the term prove in science. Finally, you might conclude that the investigator him-
self was more cautious. In the original report, he noted that his research contained no direct evidence that the difference he observed actually causes homosexuality. He also recognized that the finding needed to be replicated.

In Rival Hypotheses, Schuyler Huck and Howard Sandler provide 100 short summaries of research studies and the conclusions drawn from the data. These come from professional journals as well as the popular media. All contain a direct or subtle claim that the writer or speaker wanted the audience to accept. In each case, Huck and Sandler believe there is some problem with design, methodology, or analysis that makes it possible to account for the findings through one or more rival hypotheses. The student’s task is to detect the plausible alternative explanation. Solutions at the back of the book provide logical hypotheses that might invalidate the original claim.


B. Illusory Correlations (pp. 33–34)

Classroom Exercise: Illusory Correlation

Sometimes we perceive relationships where there are none, a tendency known as illusory correlation. Have students complete Handout 1–9. Most students will believe the researchers found that women are more likely than men to be emotional. Actually the correlation is 0.0, as the following chi square analysis shows. The participants are three times as likely to be emotional as not, regardless of sex. You can draw the table on the board to demonstrate.

<table>
<thead>
<tr>
<th>Were the subjects emotional?</th>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Were the subjects women?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>YES</td>
<td>12</td>
<td>4</td>
</tr>
<tr>
<td>NO</td>
<td>3</td>
<td>1</td>
</tr>
</tbody>
</table>

When we believe a relationship exists between two things, we are likely to notice and recall instances that confirm rather than disconfirm our belief. Illusory correlation may underlie many people’s belief that seers such as Jeanne Dixon truly have the ability to predict the future. We evaluate predictive power by noticing the prophecies that have come to pass. Actually, there are four relevant types of information. These are events that are predicted and obtained, predicted but not obtained, not predicted but obtained, and not predicted and not obtained. The box at the top of the righthand column can be used to illustrate.

Failure to take into account all the relevant information also helps explain certain common misconceptions: (1) because more accidents occur at home than elsewhere, we may believe it’s more dangerous to be at home, and (2) because more violence is committed against members of one’s own family than against anyone else, we may conclude it is more dangerous to be around family members than around strangers. The problem is that we spend more time at home than any other place and we are also around our relatives more than anyone else. Similarly, finding that more automobile accidents occur during rush hour than at any other time does not necessarily imply that it’s more dangerous to drive during rush hour. It could be, but the greater number of accidents may also occur simply because that’s when so many people are driving their cars. From sheer numbers alone, far more windshield wipers are turned on during rush hour than during any other time but that does not mean that it rains more during rush hour.

Thomas Gilovich provides an analysis of illusory correlation as it is represented in certain folk beliefs, such as “The phone always rings when you are in the shower,” “The elevator always seems to be headed in the wrong direction,” and “It always rains after you wash your car.” He makes a useful distinction between “one-sided” and “two-sided” events. Events are two-sided if opposite outcomes are equally salient, generate the same emotional intensity, and necessarily demand further action. Often, however, events have only one outcome that arouses much affect or demands further action. As an example of a one-sided event, Gilovich recalls how in entering his office building through one of six possible doors, he often seems to pick the one the custodian has left locked. Because a locked door arouses frustration and demands choice of another entrance, passing through an unlocked door goes unnoticed. Consequently, the locked doors stand out in one’s memory and support the illusory correlation. If analyzed closely, all the folk beliefs listed above may have their
basis in such “one-sided” events. After presenting Gilovich’s analysis, ask your students, “Why are wrong numbers never busy?”

Gilovich demonstrates the importance of this process in social life. In close relationships, for example, couples may conclude that they are “out of sync”: One always wants to stay home when the other needs to socialize, or one wants to make love when the other needs some space, for example. Wishing to do something when your mate does not can be frustrating and can come to occupy your mind. When things are going smoothly, events are less noteworthy. Even when events do stand out, they tend to do so by virtue of the quality of the events themselves, not by virtue of the synchrony that produced them in the first place. They are remembered as events of fun, laughter, or passion, not as instances of synchrony.


C. Perceiving Order in Random Events (pp. 34–35)

Lecture/Discussion Topic: Extraordinary Events and Chance: Your Birth Date in Pi?

You can readily extend the text discussion of how what may seem to be an extraordinary event may have a chance-related explanation. As Myers states, “An event that happens to but one in 1 billion people every day occurs about six times a day, 2000 times a year.”

Psychologist Michael Shermer brings the principle closer to home when he suggests that the law of large numbers guarantees that one-in-a-million miracles happen 295 times a day in America. Physicist Freeman Dyson states, “During the time that we are awake and actively engaged in living our lives, roughly for eight hours each day, we see and hear things happening at a rate of about one per second. So the total number of events that happen to us is about thirty thousand per day, or about a million per month. With few exceptions, these events are not miracles because they are insignificant. The chance of a miracle is about one per million events. Therefore we should expect about one miracle to happen, on the average, every month.”

One common claim of the supernatural is a person’s report of having a dream or thought about the death of a friend or relative and then receiving a phone call five minutes later about the unexpected death of that very person. Can such an event possibly be due to chance?

Physicists Georges Charpak and Henri Broch suggest that such occurrences should be expected. Suppose ten people you know die each year and that you think about each person once a year. One year contains 105,120 five-minute intervals during which you might think about each of the ten people, a probability of one out of 10,512—certainly an improbable occurrence. However, there are 295 million Americans. Assume that they think like you. That makes 1/10,512 × 295,000,000 = 28,063 people a year, or 77 people a day for whom this improbable premonition becomes probable. If just a few of these people report their experiences to the media, the paranormal is vindicated.

In his book Intuition, David Myers gives another excellent example of how we fail to appreciate the streaky nature of random data. Many mathematicians believe that the digits of pi reflect a truly random sequence. But this random sequence is likely to include each person’s birth date. For example, 3/12/89 begins at the 97,574th decimal place. Have your students visit www.angio.net/pi/piquery to find their birth dates, then have them report back to class.


Classroom Exercise: The Gambler’s Fallacy

Random sequences often do not look random. Asked to predict the sequence of six coin flips, most people state that H T T H T H is more probable than H H H H H H. Actually all possible sequences are equally likely. You can demonstrate this in class with the “gambler’s fallacy,” if you are willing to temporarily deceive your students. Tell them you are going to flip a coin a number of times, and they are to record their guess before each flip. After each of five flips of the coin, record the following fake outcomes on the board: (1) heads (2) tails (3) tails (4) tails (5) tails. After students have recorded their sixth guess, pause and ask them to agree that the outcome of the next toss is pure chance. Say, “Since it is 50–50 whether it will be heads or tails, half of you will predict each, right?” However, a show of hands will indicate that the vast majority have predicted “Heads.” Say, “You folks don’t seem to think this toss is a chance event. And that is what’s known as the gambler’s fallacy.”

Alternatively, have each student generate a random-looking string of 21 heads/tails coin tosses. Also have everyone generate a 3-digit lottery number. Then announce you will demonstrate your “psychic powers” by reading a volunteer’s mind on the coin-tossing.

Before starting, ask what level of performance would
provide evidence of mental telepathy. Virtually all will immediately understand that since 50 percent hits would be expected by chance, a larger proportion, say 60 percent, would support a claim for psychic power. Have the volunteer concentrate on the first toss generated in his or her string. Guess heads or tails, then have the volunteer tell the class and you the correct choice. Have the class keep a careful record of hits and misses. On the second trial, simply pick the alteration of the volunteer’s first choice. Following this procedure will ensure success of greater than 50 percent, simply because people tend to alternate choices in order to produce a “random” sequence. That is, people alternate too much in producing what they think is a random string, and generate few, if any, runs. After demonstrating your psychic power, explain your rule, and have the rest of the class apply it to their own string. Have them count the number of alterations, which, for the vast majority, will be more than the expected 10 out of 20. Finally, in terms of the lottery number, explain that “28 percent of the available numbers have a repeating digit, such as 474 or 166. Let’s see whether our class distribution matches this pattern, or whether—as I’d expect—fewer than 28 percent of you chose a number with a repeating digit.” Ask those with a repeating digit to raise their hands. In conclusion, note that lottery odds are badly stacked against betters. If you’re going to bet in a lottery, the rational task isn’t so much guessing the right number (which you have no control over, since any number is as likely as any other) as guessing a number that others are unlikely to guess (minimizing the sharing of any prize). Guessing a number with repeating digits is a strategy for doing this.

For an everyday example of the gambler’s fallacy, you might retell the story of a university student who insisted on purchasing a scratch-and-win lottery ticket before every exam. It was not to win but to lose and thereby “use up his bad luck” before the exam. To his astonishment and distress, one day he won $50. He called to have his exam postponed.

V. Experimentation (pp. 36–39)

A. Exploring Cause and Effect (pp. 36–37)

B. Evaluating Therapies (pp. 37–38)

Student Project: The Placebo Effect

The above video clip (see the accompanying Faculty Guide) concludes with a very good illustration of the placebo effect. The Scientific American Frontiers Web site at www.pbs.org/saf/1210/teaching/teaching.htm suggests a project in which students can demonstrate the placebo effect for themselves.

Challenge your students to assess whether the apparent effectiveness of therapeutic touch reflects the placebo effect. After showing the video, have each student find a volunteer or two outside class who will participate in a simple experiment. The only equipment students will need is a blindfold and paper and pencil to record responses.

The student should first explain to the volunteers the rationale underlying therapeutic touch. Therapists in hospitals throughout the country claim that patients can detect “energy fields.” A kind of “sixth sense” seems to enable them to feel what seems to be an invisible aura that surrounds our body. Then the student experimenters should tell their volunteers to keep their eyes open, and, flipping a coin, position their hands at least a few inches over the left or right (tails = left; heads = right) upturned palms of the volunteers. The student experimenters ask, “Can you detect any energy field associated with my hand?” and record responses for each of 10 to 15 trials. Students might also ask their volunteers to describe any specific feeling associated with the energy field, recording that as well. Finally, they should repeat the test with the participant blindfolded (keeping the blindfold out of sight until they’re ready to use it). Again, they should record the responses over an equivalent number of trials.

Have your students report their results back to class. For each condition, tabulate hits and misses on the chalkboard. The data will show the placebo effect; significantly more hits will occur when the volunteer can see the experimenter’s hand than when he or she cannot.

Videocassette: Psychology: The Human Experience, Module 3: Experimental Design

See the Faculty Guide that accompanies the Psychology: The Human Experience series by Coast Learning Systems for a description.

Scientific American Frontiers, 2nd ed., Segment 1: Tackling a Killer Disease

See the Faculty Guide that accompanies the Scientific American Frontiers series for a description.
Classroom Exercise: Main Effects and Interactions or “It All Depends”

In a classroom activity that illustrates and extends the text description of the experiment, Hank Rothgerber and Eric Anthony Day demonstrate the importance of interactions that occur when the effect of one independent variable depends on the level of a second independent variable. Many interactions will be reported later in the text.

The activity uses a 2 (typicality of the jelly bean: cherry vs. buttered popcorn or cappuccino) × 2 (prior information of the flavor given or not given) between-participants design. The dependent variable is the degree to which students’ report that their jelly bean tasted as they expected it to taste.

Before class, prepare as many envelopes as you have students in class. Place a cherry jelly bean in half the envelopes, a buttered popcorn (or cappuccino) jelly bean in the rest. Also prepare an information sheet to place in each envelope that will later enable you to identify each student’s condition. At the top of each sheet, write “C” if the envelope contains a cherry jelly bean and “B” if it contains a buttered popcorn or cappuccino jelly bean. On half the “C” sheets, print the statement, “Your jelly bean has a cherry flavor,” and on half the “B” sheets print the statement, “Your jelly bean has a buttered popcorn flavor.” Place the “C” sheets in the envelopes containing the cherry beans and “B” sheets in the envelopes containing the popcorn-flavored beans.

Introduce the exercise by telling your students that they are going to participate in a taste test of different jelly beans. Each student will taste one bean and then indicate whether it meets his or her expectations. Place the envelopes in a box and mix them thoroughly. Have each student pick one envelope out of the box. Then, have them all open their envelopes, silently read any information that may be on the information sheet, and eat the bean. Finally, at the bottom of the information sheet, they should indicate the extent to which the jelly bean tasted as they expected, using a scale from 1 = very little to 5 = very much. Collect the papers and compute the mean for each of the four conditions (for larger classes, you may want to enlist the aid of an assistant).

Before giving the results, explain that our perceptions are partly influenced by our prior knowledge of the world. In this case, taste perceptions are influenced not only by the physical properties of the jelly beans but by our expectations of how a jelly bean should taste. Announce that half the class received a cherry jelly bean, while the other half received a buttered popcorn or cappuccino jelly bean. Ask students to predict how their expectations will affect their rating of the bean’s taste. Most people expect a jelly bean to taste sweet and fruity (like cherry) not salty or bitter (like popcorn or cappuccino). The first hypothesis is that those receiving a cherry bean will be more likely to report that the flavor meets their expectations.

Then explain that some students were explicitly told the flavor of their jelly bean; others were not. What effect does this information have on taste ratings? A second hypothesis is that those given prior information would rely less on their preconceived notions and thus be more likely to find the flavor as meeting their expectations. Finally, see if students predict the presence of an interaction. A third hypothesis is that the influence of prior information will be greater for those who receive an atypical flavor.

Ask students to identify the independent and dependent variables in the study as well as how they were placed in each condition (through random assignment). Ask why it might be important, for example, that not all females be given cherry-flavored jelly beans and all males be given popcorn flavored.

Present the results in the form of a table (the following table, provided by Rothgerber and Day, illustrates typical results of both main and interaction effects). Conclude that much psychological research reports the existence of an interaction and largely explains the psychologist’s stock answer, “It all depends.”

### Taste Expectations as a Function of Jelly Bean Flavor and Prior Information (mean scores)

<table>
<thead>
<tr>
<th>Flavor</th>
<th>Prior Information</th>
<th>Main Effect (flavor)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Cherry</td>
<td>4.00</td>
<td>4.20</td>
</tr>
<tr>
<td>Buttered popcorn</td>
<td>2.00</td>
<td>3.80</td>
</tr>
<tr>
<td>Main effect (information)</td>
<td>3.00</td>
<td>4.00</td>
</tr>
</tbody>
</table>


C. Independent and Dependent Variables
(pp. 38–39)

Lecture/Discussion Topic: Description, Prediction, Explanation

Psychology’s attempts to describe, predict, and explain can be nicely illustrated by examining Milton Rokeach’s extensive research on human values. You can also use Rokeach’s studies to show how, in investigating a new area, psychologists often begin with description and progress through correlation to experimentation. Rokeach’s survey of “terminal values” asks respondents to rank the value of items such as “a comfortable life (a prosperous life)” and “an exciting life (a stimulating, active life).” Form G, the alternate form of the survey most widely used in research, presents each value on a removable gummed label and is commercially produced by Consulting Psychologists Press, Inc., 3803 East Bayshore Road, P.O. Box 10096, Palo Alto, CA 94303.

If you obtain the survey, present it to students as an example of systematic observation that permits description. A random sample of American adults ranked the values as follows:

<table>
<thead>
<tr>
<th>Value Survey Title</th>
<th>Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>A Comfortable Life</td>
<td>8</td>
</tr>
<tr>
<td>A World at Peace</td>
<td>2</td>
</tr>
<tr>
<td>A World of Beauty</td>
<td>15</td>
</tr>
<tr>
<td>Accomplishment</td>
<td>1</td>
</tr>
<tr>
<td>Inner Harmony</td>
<td>11</td>
</tr>
<tr>
<td>16 Pleasure</td>
<td>16</td>
</tr>
<tr>
<td>10 Salvation</td>
<td>12</td>
</tr>
<tr>
<td>4 Self-Respect</td>
<td>12</td>
</tr>
<tr>
<td>18 Social Recognition</td>
<td>1</td>
</tr>
<tr>
<td>6 Wisdom</td>
<td>5</td>
</tr>
<tr>
<td>National Security</td>
<td>13</td>
</tr>
<tr>
<td>10 Inner Harmony</td>
<td>11</td>
</tr>
<tr>
<td>12 Self-Respect</td>
<td>4</td>
</tr>
<tr>
<td>18 Social Recognition</td>
<td>1</td>
</tr>
<tr>
<td>3 Freedom</td>
<td>3</td>
</tr>
<tr>
<td>9 True Friendship</td>
<td>3</td>
</tr>
<tr>
<td>6 Wisdom</td>
<td>5</td>
</tr>
<tr>
<td>11 Inner Harmony</td>
<td>11</td>
</tr>
<tr>
<td>14 Mature Love</td>
<td>14</td>
</tr>
<tr>
<td>10 Salvation</td>
<td>10</td>
</tr>
<tr>
<td>9 True Friendship</td>
<td>3</td>
</tr>
<tr>
<td>6 Wisdom</td>
<td>5</td>
</tr>
</tbody>
</table>

How are value rankings related to behavior? Rokeach and other researchers have addressed that question in numerous correlational studies. Findings indicate that value rankings are predictive of a number of attitudes and actions. For example, relatively high rankings of “equality” are associated with less prejudice and greater prosocial behavior. Similarly, high rankings of “a world of beauty” are related to greater concern for the environment. Values are also correlated with one’s choice of academic major and career. For example, in one study, humanities majors placed greater value on “a world of beauty,” while social and physical science majors placed greater value on “a comfortable life.” Relationships have even been found between values and consequential choices, for example, laundry detergent purchases. While Rokeach maintains that values determine our attitudes and behavior, you might remind students that correlations do not establish causal relationships.

Under what conditions do values change? Rokeach has used the experiment to answer this question. His hypothesis was that if people recognize inconsistencies in their value system, they experience a sense of dissatisfaction and are motivated to change. To test this hypothesis, he and his colleagues produced a 30-minute television program that focused on the fact that many Americans place a relatively high ranking on freedom but a low one on equality. Hosts Ed Asner and Sandy Hill suggested that Americans “may be saying they care a great deal about their own freedom but don’t really care that much about other people’s freedom.” Compared to a control group who did not hear this message, those in the experimental group increased their ranking of equality and also responded more favorably to a solicitation for funds from an organization devoted to providing cultural opportunities for African-American children. This experiment is intended, of course, to identify causal relationships and thereby offer an explanation for value change. Be sure to have students identify independent and dependent variables, as well as factors that would need to be controlled.

Rokeach’s study also provides an example of a field, in contrast to a laboratory, experiment.

You may want to show students alternative ways of organizing and describing the data obtained from the value surveys. You might also show them how correlations between value rankings and attitudes are calculated and interpreted and how generalizations might be drawn from the values of the sample to the population in general.


VI. Statistical Reasoning (pp. 39–44)

Classroom Exercise: Teaching Statistical Concepts Using Space and Students’ Bodies

Jane Marantz Cooper suggests a number of exercises for illustrating statistical concepts in the classroom. They foster active learning and provide a vivid representation of data and quantitative relations.

Using students’ bodies and physical space in the classroom, you can illustrate the shapes of various distributions, central tendencies, and variability. With a class of 50 or fewer, you can use the entire class; with a larger class, ask for 10 to 20 volunteers, about half men and half women.

Tell your class to imagine a number line going across the front of the room with the far left wall being 0 and the far right wall being 10. On the chalkboard indicate that 0 represents “absolutely do not like at all,” 5 means “neither like nor dislike,” and 10 signifies “completely and totally like.” Ask your students to position themselves along the line according to how
they feel about the stimuli you will describe. If two or more students have the same feeling, they should stand in single file behind each other. What occurs, of course, is a human frequency distribution or histogram.

Begin with the following request: “Position yourself along the line according to how you feel about using computers.” The stimulus, Cooper reports, typically elicits a normal curve, that is, a relatively symmetrical distribution with a center around 5. Ask students to describe the pattern verbally. Where is the center? How spread out is the set of scores? What is the range? Do the scores cluster? Position yourself about where the median is to facilitate a discussion of central tendency. Ask, what is the mode? How would we calculate the mean?

To illustrate a skewed distribution, say, “Position yourself on the number according to how you feel about chocolate.” You likely will obtain a pile-up of students at 9 or 10 with a few trailing down to 5—a negatively skewed distribution. For a bimodal distribution (often differentiated by gender with little or no overlap), tell your class to “position yourself on the number according to how you feel about watching football on television.” Occasionally, you may get an outlier—a man who intensely dislikes football or a woman who likes it intensely.

For spatial representations of other statistical concepts including correlation, scatterplot, and regression see the reference below.


Lecture/Discussion Topic: The Case for Statistical Analysis

The text notes that statistics can help us see what the naked eye sometimes misses. Few people detect the correlation between height and temperament in text Table 1.2 (p. 31) simply by viewing the data. Dennis Jennings and his colleagues have documented our fallibility in detecting correlation. Presenting their results in class provides students with a convincing rationale for the need for statistical analysis.

Jennings and his colleagues provided college students with three sets of paired data to examine. One set contained 10 pairs of numbers, another set contained drawings of 10 men of different heights with walking sticks of different lengths, and the final set consisted of audiotapes of 10 people saying a letter of the alphabet and then singing a musical note (the relationship of interest was the alphabetical position of the letter and the duration of the note). The paired variables within each set of data correlated between 0 and a perfect 1.00. Students were asked to indicate the presence and strength of any relationship.

The results indicated that participants did not reliably detect a relationship in the three data sets until the correlation reached .60 or .70. For example, when the correlations were between .20 and .40 (quite typical of those found in psychological research), they estimated the relationship to be barely above zero (actually an average of 4 to 8 points on the 100-point scale). Only when correlations were more than .80 did participants’ ratings average 50 on the 100-point scale. Even correlations of 1.00 elicited average ratings of less than 85. In short, moderately strong positive correlations went undetected and very strong correlations were judged as moderate in size.


A. Describing Data (pp. 40–42)

Student Project: Organizing and Interpreting Data

Handout 1–10 gives students some elementary practice in organizing and interpreting real data. Suggested by David Moore, it involves the ages of American presidents at the time of their inauguration. Students can organize the data into a bar graph; determine mean, median, and mode; and even calculate the range and standard deviation. (For your information, the distribution of ages is roughly symmetric. The mean age of a new president is 54.83, the mode is 51, and the median is 55. The range is from 42 to 69, or 27 years, and the standard deviation is 6.27.)


Classroom Exercise/Student Project: Describing Data

Descriptive statistics is effectively taught by example. In fact, it may be best to illustrate the basic concepts of statistics through data provided by the students themselves. Handout 1–11 allows you to collect a variety of data. You can add and delete questions as you like. The text uses family income and test scores to illustrate a variety of descriptive statistics. To reinforce text material, you could run through the same examples using data from your class. Depending on class size and time constraints, you can use the class period to organize and describe the data, or you can collect the surveys and prepare a data sheet. In the following class period, students can, either individually or in small groups, calculate the final statistics. All the concepts introduced in the text can be illustrated with these data, including distributions, percentile rank, central tendencies, variation, and correlation. (Reminding students to bring along hand calculators will facilitate the entire process.) You
can also use the data to test for differences between
groups. For example, do first-borns have a higher GPA
or higher SAT scores? Similarly, do males and females
differ in GPA and SAT scores?

*PsychSim 5: Descriptive Statistics*

This program begins by explaining data distributions,
showing how they are more clearly depicted on bar
graphs. It allows students to practice calculating meas-
ures of central tendency—mean, median, and mode—
and measures of variation. Students see how the
measures describe data differently. The program can
be used effectively to review all the material on
descriptive statistics.

**B. Making Inferences** (pp. 42–44)

*Lecture/Discussion Topic: The Power of Vivid Cases*

The temptation to generalize from a few unrepresenta-
tive but vivid cases is nearly irresistible. You might cite
two studies by Richard Nisbett and his colleagues to
reinforce this point. In the first, college psychology
majors were asked what courses they planned to take in
the future. Before indicating their choices, they were
given evaluations of the courses, either verbally from a
couple of students or by reading a statistical summary
of the ratings of all students who had taken the courses
during the previous term. Which was more influential
in shaping participants’ preferences? The opinions ver-
balized by the two students.

In the second study, participants were shown a
videotaped interview with a prison guard whose
responses were either compassionate or inhumane.
Some were told that the guard being interviewed was
highly typical of all guards; others were told that the
guard was atypical. This information had no effect on
the participants’ judgment of prison guards as a group.
Their attitudes were shaped by the interview they had
watched.

of abstract vs. concrete information on decisions. *Journal

Hamill, R., Wilson, T., & Nisbett, R. (1980). Insensitivity
to sample bias: Generalizing from atypical cases. *Journal

*Classroom Exercise: An M&M’s Sampling
Demonstration*

Fun-size packs of plain M&M’s provide the basis for
Randolph Smith’s tasty and lively demonstration of
sampling principles. From a small sample of 24
M&M’s, can students accurately predict the total distri-
bution of colors in the world’s M&M population (over
400 million are produced each day)? At http://us.
mms.com/us/about/products/milkchocolate/Mars.Inc.
reports the actual percentages: For plain M&M’s,
13 percent each are brown and red, 14 percent are yel-
low, 24 percent are blue, 20 percent are orange, and
16 percent are green.

Buy the large bags of small packs and allow each
student to choose an “intact random sample” from the
population of samples. Begin by identifying the colors
and asking students to estimate from their own experi-
ence what might be the actual distribution.

Draw the following data sheet on the board (or
make a copy for each student):

<table>
<thead>
<tr>
<th></th>
<th>Blue</th>
<th>Brown</th>
<th>Green</th>
<th>Orange</th>
<th>Red</th>
<th>Yellow</th>
</tr>
</thead>
<tbody>
<tr>
<td>Observed frequency</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Predicted %</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Students should open their bags, count each color,
and make a simple frequency distribution. Sample sizes,
although approximately 24, will vary. Have them con-
vert their raw data into percentages to form a hypothe-
sis about the actual population. Have students form
pairs to pool their data (not literally) and then revise
their hypothesis. Pool the data for the entire class to
generate a final hypothesis.

Your class will typically find that the individual
samples vary widely and that the initial hypotheses are
not very accurate. However, as the samples grow larger,
the estimates of the population decrease in variability
and more accurately approximate the population fig-
ures. At the end, compare your fit of the classroom’s
data with the actual Mars distribution (if you like, use
the chi square statistic).

Obviously, you can also use this demonstration to
illustrate and review the various measures of central
tendency and variation. Smith suggests a writing
assignment in which students communicate their statisti-
cal findings in a letter to Mars, Inc. The address is
M&M/MARS, Attention: Consumer Affairs Depart-
ment, 800 High Street, Hackettstown, NJ 07840. Both you and your students will discover whether they truly understand the concepts of sampling and of drawing inferences from samples.


Classroom Exercise: The Birthday Coincidence and Other Remarkable Facts

You can demonstrate the deficiency in our statistical intuitions with the birthday “coincidence.” Ask students what they think is the probability that 2 people in a group of 30 will share the same birthday. Most will greatly underestimate the correct answer, which is 7 in 10. With a larger group, the probability is of course higher. You can demonstrate this if you have a class of 30 or more. Tell students to give their birthday (month and day), one at a time. When a date is named, any student having the same birthday should so indicate. With my classes of 40 to 50, it has never failed.

You might also ask students to answer this question: Given any two people in the United States, how many intermediaries are necessary, on the average, before the two are in communication, assuming that the intermediaries may only contact people they know on a first-name basis? Stanley Milgram reports an average of 5 people.

Ask students to imagine a huge piece of paper about the thickness of one textbook page. If it were folded in half 50 times, how thick would it be? The answer is 250 times the original thickness, or about 50,000,000 miles!

Assuming a world population of about 5.5 billion, if we gathered everyone together and allotted each person a generous two-by-two feet of ground, how large an area would we need? The answer is less than 800 square miles, only about the size of Jacksonville, Florida.

What if we allowed everyone a spacious cubical apartment of 20 feet on a side? The answer is that every human being on earth would fit comfortably into the Grand Canyon.


Classroom Exercise: More Cases Are Better Than Fewer

The smaller the sample, the less reliable is the generalization based on it. For example, if we flip a coin four times, it would not be uncommon that by mere chance we would get three heads; with 100 flips, the chance of obtaining a proportion so out of line with the real odds of 50–50 is extremely small.

Christopher Jepson, David Krantz, and Richard Nisbett have designed a number of problems to teach the principle that a large random sample is more representative of the population from which it is drawn than is a small one. One of their problems is presented in the text. Three other problems are presented on Handout 1–12. Give students 7 or 8 minutes to read the specific examples and write a one- or two-sentence response in the blanks provided. Then have students compare their answers with the following ones elicited by the researchers. In each case, the second answer represents an understanding that averages based on more cases are more reliable (that is, less variable) than averages based on but a few cases.

1. A. “It’s kind of funny that I think about the same question myself. I have had to explain it to myself in this way: As the season commences a player will, I think, become less motivated to impress people with a powerful bat—he is taking a sort of ho-hum attitude about it.”

B. “One time at bat has a much greater effect on one’s average early in the season than at the end. For example, if someone bats twice after two weeks and gets one hit, his average is .500, but it may not be a true indication of how well he bats. The more frequently he bats, the clearer the true information as to how well a batter hits.”

2. A. “He should go to the Ivy League school because he is not his friends. Their feelings aren’t necessarily his. After high school people tend to go on their own way. David liked the Ivy (League) school, then that’s where he belongs.”

B. “David just saw the Ivy League university for one day. His friends’ reports are based on an entire year. So he should take his friends’ word for it. Chances are that the liberal arts college is better.”
3. A. “Mr. Simpson should be picked. People were impressed with him. Perhaps he was unhappy where he was and/or had personal problems which caused the personality reservations and dislikes. But people should be chosen on the basis of how they personally present themselves and not on the basis of what others have to say about them.”

B. “Mr. Barker, because the people at the place he worked at knew him longer so they would know whether he was amiable. First impressions aren’t too reliable.”

Classroom Exercise: Sample Size

To see whether students can apply the principle they’ve learned in the previous exercise (or simply as an alternative to it), distribute Handout 1–13.

In situation 1, the shorter game gives the weaker player a much better chance of winning. To beat Tiger Woods, you would need fewer lucky shots in playing 1 hole than in playing 18.

In the second situation, the smaller hospital will have many more days of 60 percent boys. In fact, the smaller hospital will have 55 such days a year, on the average, while the large one will have only 27. (Kahneman and Tversky found that only about one person in five makes the correct choice.)

Finally, in the last situation, most people will find the smaller sample more compelling, since the black balls are in the majority by a three-to-one margin, whereas the larger sample has only a little more than half black balls. Nevertheless, in terms of probability theory, the latter provides the more convincing evidence. The odds that it accurately indicates the majority color in the urn are 16 to 1. The odds that the smaller sample does are only 4 to 1.

Emphasize that the failure to consider sample size leads people to be too confident of exact percentage results from small numbers and not trusting enough of percentage results from large, representative samples.

Classroom Exercise/Student Project: When Is a Difference Significant?

The text indicates that data are “noisy.” Differences between the average scores of two groups may be due to chance variation rather than to any real difference. Only when sample averages are reliable and the difference between them is large do we obtain statistical significance. You can effectively illustrate the problem psychologists face in judging differences to be significant with a brief classroom exercise (or you can assign it as an out-of-class project and have students report their results at the next class session).

The exercise uses the counterintuitive fact that, due to their construction, pennies placed on edge on a hard table show a definite tendency to land “heads” more often than “tails.” (In fact, about 4 out of 5 times they will fall “heads.”) Begin by placing eight to ten pennies on edge on a smooth table or desk (requires a steady hand, a little practice, and newer pennies). Jar the table by dropping a book on it so that the pennies will fall. (Do not jar it so hard that they flip.) Count the number of heads, which is likely to be greater than the number of tails. Ask students to explain for the difference. Most will attribute it to chance. They will note that, just as when you flip a coin several times, the number of heads and tails may not be equal.

Have your students pair off, then distribute eight or ten coins to each pair and ask them to place the pennies on edge. Walk around the room jarring each table or desk and have the students report the results to the full class. Write the results on the chalkboard, carefully keeping track of the total number of heads and tails. As each student pair reports their results, continue asking the class whether they believe the difference in the number of heads versus tails is due to chance or to some real difference. This is essentially the question psychologists ask when judging the differences between any two groups. Averages based on more cases, of course, will be more reliable. Although there is certain to be considerable variation in the small sample tested by each student pair, the overall pattern of significantly more heads than tails will emerge and at some point the majority of students will agree that the difference is not due to chance. Note that for psychologists, proof beyond a reasonable doubt means that they do not make much of a difference unless the odds of it occurring by chance are less than 5 percent.


Lecture/Discussion Topic: Differences Between Groups

In extending the text discussion of significant differences between groups you may want to make a number of points. First, the need for two sample groups can be readily overlooked. To make this point, Richard Sprinthall cites that a common argument against capital punishment is that it has no deterrent effect. Support for this argument is sometimes found in the fact that, years ago, pickpockets worked the very crowds observing the public hangings of other convicted pickpockets. As Sprinthall points out, the fallacy is that there is no comparison (control) group. How about the number of pockets picked in crowds at a horse race or a carnival? If pocket picking was lower at the public hangings, then perhaps capital punishment did have a deterrent effect. Similarly, advertisers may claim that their toothpaste is superior because users have few cavities, or that their cars are superior because 90 percent of those manufactured are still on the road after 15 years. Without having comparison groups, we are unable to
evaluate the claims. In other cases, we may not know whether the comparison group is appropriate. For example, during the Vietnam War, the number of Americans who died in Vietnam was lower than the number of Americans who died in the United States. May we conclude that it is safer to go to war than to remain home? A detergent manufacturer claims that its dishwashing liquid has been found to be 35 percent more effective. Should you switch to its brand? A major corporation proudly claims that its profits have increased 150 percent over those in the previous year. Should one rush out and buy its stock? In each case, we cannot make an informed judgment without knowing the nature of the comparison group.

A second point worth emphasizing is that statistical tests really do not give us a “yes” or “no” answer to our question of whether there is a real difference between two groups. They merely tell us the statistical probability that the observed difference was caused by chance. Moreover, we are vulnerable to two errors in making judgments about differences. We make a Type I error when we conclude there is a difference when in fact there is none, and we make a Type II error when we conclude there is no difference when in fact there is one. We reduce the chance of error by balancing the two types of errors against each other. This is done by choosing a level of statistical probability that is neither too liberal (favoring Type I errors) nor too conservative (favoring Type II errors). Traditionally, the significance level used by psychologists is .05, which means that if the odds of the difference obtained in research would occur less than 5 percent of the time by chance, the difference is judged to be genuine.

Finally, it is worth emphasizing that “statistical significance” is not to be equated with practical significance. In addition to the text example of birth order and intelligence, you might note Robert Rosenthal’s recent review of medical research. In one study, which students are likely to be familiar with, aspirin was found to significantly reduce the risk of heart attacks. In fact, the researchers ended the investigation early because the results were clear and they thought that continuing to give one group of patients placebos instead of aspirin would have been unethical. In examining the data, Rosenthal found that the researchers were dealing with a correlation of about .03, which accounted for less than 1 percent of the variance. Rosenthal found similar small correlations in research on the causes of alcoholism and the effectiveness of AZT in treating AIDS symptoms. Clearly, the question of importance is a subjective judgment. Being able to save even a few lives can be important. Rosenthal’s analysis also highlights the fact that behaviors are often determined by a large number of causes. The purpose of most research is to account for only a fraction of the variance in behavior.


**Student Project: Statistics and Consumer-Oriented Research**

To help students understand how research design and statistics are used in everyday situations, and to help them make better judgments about advertisers’ claims, you might assign a project suggested by Bernard Beins. The task is simple. Students are to isolate specific instances in which manufacturers make claims based on research and then phone or write the companies for further information. They are to report to the entire class as they receive responses to their inquiries.

Beins’ students contacted a variety of companies, including soft drink, cereal, infant vitamins, and automobile manufacturers. Their reaction to the responses was increased skepticism and increased respect for market research. Skepticism increased when companies treated students with suspicion or failed to send promised information. Students also learned that advertisers are very good at setting the stage for specious inferences by consumers. One example occurred in a letter from Union Carbide, the manufacturer of Energizer batteries. The student who wrote had interpreted the claim that “Of all leading brands, nothing outlasts the Energizer” to mean that the battery “outlasts them all.” The company noted that “you have read something into these ads which is not there. We have never used the phrase ‘outlasts them all,’ or any words to that effect.”

Students also realized that some marketing research is well conducted. For example, one manufacturer of bicycle helmets sent a complete technical report written by an independent cyclists’ group in Washington, DC. In evaluating the report, students could find no flaws in design or interpretation.


**VII. Frequently Asked Questions About Psychology** (pp. 44–50)

**A. Can Laboratory Experiments Illuminate Everyday Life?** (p. 45)

*Lecture/Discussion Topic: Experimentation in the Field*

In an attempt to overcome the artificiality of the laboratory environment, some researchers conduct field experiments. For example, do the race and sex of a person who requests help influence our generosity? John Brigham and Curtis Richardson attempted to answer
that question with a field experiment. Confederates entered convenience stores and attempted to buy an item that cost between $1.15 and $1.50. When it came time to pay the sales clerk, they found they had only a dollar. They asked if the clerk would sell it for less. In this experiment the salespersons were the research participants and the independent variables were the sex (male or female) and the race (black or white) of the shoppers. The dependent variable was the clerk’s willingness to sell the item for one dollar. Results indicated that both whites and females were more likely to be treated generously.

It should be made clear to students that what field experiments gain in realism, they often lose in terms of control over extraneous variables. Critics have also argued that field experimentation involves an invasion of privacy because participants are observed without their knowledge or consent. Field researchers have argued that the rights of participants are protected by preserving their anonymity and by not subjecting them to conditions they would not otherwise encounter.


**B. Does Behavior Depend on One’s Culture?**

(PP. 45–46)

*Lecture/Discussion Topic: Differences in Cultural Norms*

Cultural diversity fascinates students, and you can extend the text discussion in a variety of ways. One approach is simply to cite some differences in cultural norms. Here are some examples to present in class.

—Hissing is a polite way to show respect for superiors in Japan.
—In the village of Bang Chan in Thailand, face-to-face conflict must be avoided at all costs, even to the point of not reporting something unpleasant. For example, one would not say, “Your house is burning.” Better to ask, “Why don’t you go see your house?” The polite way to say “no” is to giggle. Although women may be greatly disturbed by their husbands’ taking additional wives, they would say nothing because they would not want to put anyone on the spot.
—Among the Karaki of New Guinea a man is considered “abnormal” if he has not engaged in homosexual behavior before marriage.
—In many societies where hunger is endemic, fat women are viewed as much more attractive than slender ones.

—In Japan, it’s quite acceptable for parents to hire an agency to investigate the background of their daughter’s potential marriage partner.
—By leaving some food on the plate, a guest in India indicates the generosity of the host who has put so much food out that no one could eat it all. In fact, well-meaning visitors can find themselves offending their hosts by following their own custom of eating all the food served to them.
—Public displays of affection between men and women in Thailand are unacceptable. Interestingly, however, men holding hands is considered a sign of friendship.
—In Latin cultures, children, especially girls, are socialized to value conformity to social norms. Rebelliousness and delinquency are rare. Mexican adolescents will be reluctant to engage in any activity that might bring shame to their families.

An interesting and provocative question to raise for classroom discussion is the issue of how we deal with cultural practices that violate our own cultural values. Respect for diversity, including norms practiced by cultures radically different from our own, sounds like a wonderful ideal, but how should we react when it clashes with some deeply held value, such as gender equality? Certainly we will agree that we needn’t be accepting of brutality, say, genital mutilation that is common in African countries. But what about other gender roles and practices in Muslim cultures such as Kuwait or Saudi Arabia? How about the law in Saudi Arabia that forbids women to drive? Or, in the Sudan, the requirement that a woman may not leave the country without the permission of her husband, father, or brother? In short, what are the limits to tolerance?


**C. Does Behavior Vary With Gender?** (PP. 46)

*Lecture/Discussion Topic: Gender Differences*

Introduce or conclude the text’s brief discussion of gender differences with some delightful examples from Carol Ann Rinzler’s “The Annotated Adam and Eve” and Harr Estoff Marano nd Erik Straud’s “Points of Departure.” They note that men and women, although equal, are not the same. For example, men are more likely to hiccup, and they produce twice as much saliva. More boys than girls sleepwalk. Women have only four-fifths as many red blood cells in each drop of their blood. Women suffer more from throbbing migraine headaches, men from piercing cluster headaches. Ask your students some of the following.

—In many societies where hunger is endemic, fat women are viewed as much more attractive than slender ones.
1. Whose hands are warmer? Usually a man’s because, at room temperature, healthy men have a larger flow of blood to their fingers than do healthy women. When a woman warms up, however, the flow of blood to her hands will exceed a man’s because her blood vessels are more expandable. Thus, her body can accept 40 percent more blood during pregnancy with no increase in blood pressure.

2. Whose forehead is more likely to feel warm? A woman’s, but it depends on the time of month. Normal temperature of either sex is 98.6°F. However, at ovulation a woman’s temperature increases about one degree and remains there for 12 to 14 days until just before menstruation.

3. Whose armpits are smellier? A woman’s. Men perspire most heavily on the upper chest from glands secreting only salts and water. Women sweat most heavily under the arms from glands that secrete fatty substances in addition to salts and water. Bacteria digest the fatty substances and their byproducts make this sweat smelly.

4. Whose nose knows this rose from that rose? Probably a woman’s. The ability to smell, taste, and hear is influenced by a variety of hormones but especially the adrenal hormones. At almost every point in the cycle, a woman’s senses are more acute. Her senses become even sharper as the monthly production of estrogen increases, peaking at ovulation.

5. Who is most likely to wake in the night with a stomachache? A man, two to one. A gnawing pain in the middle of the night is a common symptom of a duodenal ulcer, still primarily a male affliction.

6. Who’s grasping for air in the bedroom? Probably a man. Men below age 55 are 10 to 15 times more likely to suffer from sleep apnea (see Chapter 5). After age 55 women catch up.

7. Who’s that sneezing in the living room? If it’s hay fever season, probably a man. The people most likely to be afflicted by airborne allergies are 18-to-24-year-old men, 33 percent of whom suffer when there’s house dust or pollen in the air, versus only 24 percent of women that age. Men of all ages are more likely to be allergic to plant pollens, women are more likely to be allergic to cats and dogs. No one knows why.

8. Who is more likely to be depressed? In 2003, 19 million Americans suffered a serious depression. Two out of three were women. Over the course of their lives, 21.3 percent of women and 12.7 percent of men experience at least one bout of depression.

9. Who is more likely to develop Parkinson’s disease? Alzheimer’s disease? Men are twice as likely as women to develop Parkinson’s. Women are twice as likely as men to develop Alzheimer’s.

10. Whose heart will still be beating when it’s 78 years old? Odds are, a woman’s. Life expectancy is approximately 80 years and 75 years for U.S. women and men, respectively.

See the following articles for more examples.


D. Why Do Psychologists Study Animals?  
(pp. 46–47)

*Videocassette: Scientific American Frontiers, 2nd ed., Segment 4: Return to the Wild*

See the Faculty Guide that accompanies the Scientific American *Frontiers* series for a description.

E. Is It Ethical to Experiment on Animals?  
(pp. 47–48)

*Classroom Exercise: Animal Rights*

Handout 1–14, Ruben Bolling’s “Tom the Dancing Bug,” provides a wonderful introduction to the ethics of experimenting on animals. It reinforces the text point that we value animals according to their perceived similarity to us. You can distribute it as it appears, or, before copying, you can “white out” the four columns on the right and then have students complete them with the appropriate response.

Harold Herzog briefly summarizes two of the most influential arguments used by animal rights activists and provides a classroom exercise that stimulates discussion of the debate over animal research.

The utilitarian argument uses the principle of equality to oppose the use of animals in research. Peter Singer maintains that just as differences in intelligence, race, and gender are not valid criteria to exploit other humans, a creature’s species is equally irrelevant. He claims, “From an ethical point of view we all stand on an equal footing — whether we stand on two feet, or four, or none at all.” The only relevant moral criterion for discrimination for or against a species is the capacity to suffer. By definition, all sentient animals have the capacity to suffer, and thus are the subject of equal moral consideration. Speciesism (prejudice toward the interests of one’s own species and against the interests of another species) is as morally repugnant as racism or sexism. Research with animals is permissible only if we would also consider using human participants for the same experiments.

The second argument is that at least some creatures have fundamental rights (for example, the right not to be harmed). Many philosophers have answered the question “Who is entitled to hold rights?” by establishing criteria such as language, self-consciousness, or the
ability to enter into reciprocal contractual obligations. These criteria presumably eliminate nonhuman animals. However, some humans (the severely retarded, infants, the mentally ill) do not meet the criteria, and some animals (primates, cetaceans) do, creating problems for this position. Animal rights theorists resolve the dilemma by broadening the criteria. For example, Tom Regan argues that “inherent value” is the criterion for having rights and that animals must therefore be included. Like humans, they have the right to be treated with respect and the right not to be harmed. When science treats animals as renewable resources rather than creatures with inherent values, it violates the respect principle. The fact that animal research could benefit hundreds of thousands of human lives is morally irrelevant.

To facilitate thinking about this issue, Herzog has students decide whether a series of hypothetical research and educational projects should be conducted. Explain to your students that institutions receiving federal funds for scientific research must have a standing Animal Care and Use Committee (ACUC) to review and approve all animal research conducted at the institution. In the exercise, students will be role-playing members of the committee. Divide the class into groups of between five and seven students and distribute Handout 1–15, which describes four research proposals. Instruct each group to approve or reject each proposal and to provide a rationale for its decision. (If time is limited, have each group discuss only one proposal.) Encourage the groups to reach consensus rather than simply taking a straw poll on each proposal. Have each group appoint a spokesperson to report the decision and rationale to the rest of the class.

In focusing the final discussion with the entire class, note that Case 1 forces consideration of whether injury to another species closely related to humans is justified if the results will be applicable to human beings. Case 2, which prompts students to think about the use of animals when there is no direct human application, can be used to discuss the importance of pure research in scientific progress. Case 3 involves the question of whether pound animals should be used in research. Several states have banned the use of such animals for biomedical research or for student surgeries in veterinary schools. Case 4, involving the use of animals in student laboratories, has been singled out by animal welfare groups as particularly unnecessary. Videotapes and computer simulations are, they argue, adequate substitutes.


F. Is It Ethical to Experiment on People? (p. 48)

Lecture/Discussion Topic: Invasion of Privacy

Should researchers respect people’s right to privacy, that is, to decide “when, where, to whom, and to what extent [their] attitudes, beliefs, and behavior” will be revealed to other people? Although the APA ethical guidelines are not explicit on this, they do say that “the ethical investigator will assume responsibility for undertaking a study involving covert investigation in private situations only after careful consideration and consultation.” As Mark Leary notes, the circumstances under which investigators may collect data without participants’ knowledge is left to the researcher to decide. Generally, investigators believe that the observation of people in public places does not constitute invasion of privacy. Invasion of privacy becomes an issue where people reasonably expect privacy.

Both the complexity and controversy surrounding research ethics can be illustrated with some specific examples. Ask your students if they think any of the following actual studies, as reported in Leary (2001), constituted an unethical invasion of privacy. Also have them indicate the criteria they used to decide whether the study is unacceptable. You are likely to get some lively debate.

- Men using a public restroom are observed surreptitiously by a researcher hidden in a toilet stall, who records the time they take to urinate (Middlemist, Knowles, & Matter, 1976).
- A researcher pretends to be a lookout for gay men having sex in a public restroom. On the basis of the men’s car license plates, the researcher tracks down the participants through the Department of Motor Vehicles. Then, under the guise of another study, he interviews them in their homes (Humphreys, 1975).
- Researchers covertly film people who strip the parts from seemingly abandoned cars (Zimbardo, 1969).
- Participants waiting for an experiment are videotaped without their prior knowledge or consent. However, they are given the option of erasing the tapes if they do not want their tapes to be used for research purposes (Ickes, 1982).
- Researchers stage a shoplifting episode in a drug store, and shoppers’ reactions are observed (Gelfand, Hartmann, Walder, & Page, 1973).
- Researchers hide under dormitory beds and eavesdrop on college students’ conversations (Henle & Hubbell, 1938).
- Researchers embarrass participants by asking them to sing “Feelings” (Leary, Landel, & Patton, 1996).
• Researchers approach members of the other sex on a college campus and ask them to have sex (Clark & Hatfield, 1989).


Lecture/Discussion Topic: Research Ethics

Much can be said about the ethics of research in class, but it is perhaps best to deal with this issue in the context of specific studies. For example, you might mention Stanley Milgram’s studies of obedience (see Chapter 18), which heightened awareness of the problems of deception in research and of psychological harm to participants. One general point, however, is worth emphasizing. Practically all the ethical issues reflect a conflict between the rights of the individual and the possible benefits of the research to society. Thus, resolving the issues is always difficult and psychologists have typically applied a cost-benefit analysis. Does the potential benefit of the study to society outweigh the potential costs to participants? Some find such an analysis appropriate, while others argue that it reflects little more than ends-justifying-means thinking. As a result, in recent years psychologists have developed a heightened sensitivity to the rights of those who volunteer as research participants in their experiments. For example, in response to the problem of pain and anxiety, the principle of informed consent requires that participants be informed of any risks or dangers involved in an experiment before they decide whether to participate. In dealing with the problem of embarrassment, participants must be told from the start that they are free to withdraw at any time without penalty.

The controversy over the use of deception in psychological research is reflected in an exchange between Diana Baumrind and Robert Baron. A review of the main points of their debate can stimulate students’ interest and thinking about this important issue.

Baumrind argues that when research participants are given false or incomplete information, they are “deprived of their right to decide freely and rationally how they wish to invest their time and persons.” The psychological costs of deception are particularly severe when they reduce participants’ trust in legitimate authority, negatively affect their ability to trust their own judgment, and impair their sense of self-esteem. Baumrind suggests that debriefing participants does not automatically reverse these undesirable aftereffects. For example, in Milgram’s famous studies of obedience, debriefing did not restore the participants’ self-esteem or willingness to trust authorities in the future.

Baron responds that Baumrind overstates the potential costs of deception and underestimates both the necessity and potential benefits of such procedures. Moreover, researchers are sensitive to the use of deception and thus employ “informed consent” and “thorough debriefing” to mitigate the problem. Deception, Baron suggests, is essential in certain studies—for example, in investigating bystander reaction in emergency situations and in analyzing subtle forms of racial bias. The use of temporary deception in research has enabled important insights into why groups often make more extreme decisions than individuals, why humor may inhibit aggression, and why similarity rather than complementarity leads to marital satisfaction. Baron further argues that when participants learn why the deception was necessary, they do not seem to experience the negative reactions described by Baumrind. On the contrary, the vast majority respond positively. Finally, Baron maintains that the insight participants gain into themselves as a result of debriefing is a valuable experience, even when the information is not flattering.


G. Is Psychology Free of Value Judgments? (pp. 48–49)

Lecture/Discussion Topic: Psychology and Human Values

You might instruct students to be alert to the variety of ways in which values enter psychology as they read through the text. It’s an issue that will be noted frequently.

For example, our preconceptions bias our observations and interpretations. This will become most apparent in the chapters on perception and thought (see Chapters 6 and 10). A classic demonstration of this principle was provided by the study of a Princeton-Dartmouth football game played in the 1950s. The game had been billed as a grudge match and, indeed, turned out to be one of the roughest games in the history of the schools. Soon after the game, psychologists Albert Hastorf and Hadley Cantril showed films of the game to students on each campus. What did they see? Each saw the players from their own school as the victims rather than instigators of aggression. Infractions of the rules were attributed to the other side.

Values also penetrate the theories proposed by psychologists. As students will learn, personality psychologist Abraham Maslow is well known for his description of “self-actualized” persons who, with their needs for survival, safety, belongingness, and self-esteem satisfied, move on to fulfill their full human potential. Clearly, the initial selection of “self-actualized” persons was done on a subjective basis and reflected Maslow’s own personal values. Similarly, in a study of sexuality the labels “erotophiles” and “erotophobes” for those with positive and negative sexual attitudes, respectively,
clearly reflect the researchers’ own biases. Persons holding different values might well do a reversal, labeling “erotophiles” as “promiscuous” and “erotophobes” as “self-disciplined.”

Perhaps the most seductive error is to translate one’s description of what is into a prescription of what ought to be. This has been called the naturalistic fallacy. Chapter 4 reports Lawrence Kohlberg’s research on moral development. He observes that moral judgment unfolds through a consistent series of stages. Since few people seem to reach the “highest” stage, experiments have been conducted to see whether people can be stimulated to achieve higher levels of maturity. There is an obvious shift here from the objective description of the stages to a prescription for achieving the “highest” stage. While one may agree with the goals of such research, it is clear that values are introduced in moving from “what is” to “what ought to be.”


Lecture/Discussion Topic: The Instructor’s Perspective and Values

The text recognizes that psychologists can view human nature from a variety of perspectives and that “psychology is definitely not value-free.” Early in the course you might trace the history of your own involvement in psychology. What stimulated your interest? How did it develop? What are your current interests? What are your own assumptions, values, and commitments, and how do they affect your teaching and research? This self-disclosure will introduce you to your students and will also embody the main point of the text section, “Is Psychology Free of Value Judgments?”

H. Is Psychology Potentially Dangerous? (p. 49)
## Fact or Falsehood?

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<thead>
<tr>
<th></th>
<th>1. Human intuition is remarkably accurate and free from error.</th>
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<td></td>
<td>2. Most people seem to lack confidence in the accuracy of their beliefs.</td>
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<td>3. Case studies are particularly useful because of the similarities we all share.</td>
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<td>4. We tend to overestimate the number of people who share our attitudes and beliefs.</td>
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<td>5. The opinions of 1500 randomly selected people can provide a very accurate picture of the opinions of an entire nation.</td>
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<td>6. Research suggests that college students spend more than 25 percent of their waking hours in conversation.</td>
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<td>7. The scientific finding that children who watch violence on television tend to be violent proves that viewing violence causes it.</td>
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<td>8. The purpose of the experiment is to re-create behaviors exactly as they occur in everyday life.</td>
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<td>9. As a science, psychology is objective and value-free.</td>
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<td>10. States with the death penalty have lower homicide rates.</td>
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</table>
HANDOUT 1–2

Explaining Research

Researchers have found that people with high self-confidence are more susceptible to flattery than those with low self-confidence. In a sentence or two, why do you think this is true?

Does the finding strike you as surprising or not surprising?

_____ surprising

_____ not surprising

HANDOUT 1–2

Explaining Research

Researchers have found that people with low self-confidence are more susceptible to flattery than those with high self-confidence. In a sentence or two, why do you think this is true?

Does the finding strike you as surprising or not surprising?

_____ surprising

_____ not surprising
HANDOUT 1–3

For each of the following questions, answer in terms of a range within which you expect the correct answer will almost certainly fall. Given a 98 percent confidence level, if you give answers between 100 and 200, for example, this would mean you think there is only a 2 percent chance that the real answer is either less than 100 or more than 200.

1. I feel 98 percent certain that the area of the United States is more than _____ square miles but less than _____ square miles.

2. I feel 98 percent certain that in 2003 the population of Australia was more than _____ but less than _____.

3. I feel 98 percent certain that the number of American battle deaths in the Spanish-American War was more than _____ but less than _____.

4. I feel 98 percent certain that in 2002 the number of female engineers in the United States was more than _____ but less than _____.

5. I feel 98 percent certain that in 2002 the number of operating nuclear plants in the world was more than _____ but less than _____.

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<th>Handout 1–4a</th>
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<tr>
<td><strong>BIRTHDAYS: MARCH 21–SEPTEMBER 22</strong></td>
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<td><strong>A</strong></td>
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<td>sensitive</td>
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<td>nurturing</td>
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<td>compassionate</td>
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<td>cautious</td>
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<td>loyal</td>
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<td>patient</td>
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<td>extraverted</td>
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<td>generous</td>
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<td>authoritative</td>
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<td>affectionate</td>
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</table>
HANDOUT 1–4b

BIRTHDAYS: AFTER SEPTEMBER 22 AND BEFORE MARCH 21

**G**

- warm
- sensitive
- artistic
- undisciplined
- emotional
- compassionate
- easygoing
- adaptable

**H**

- secretive
- forceful
- romantic
- intolerant
- tactless
- intense
- insightful
- loyal

**I**

- honest
- impulsive
- optimistic
- nonchalant
- outspoken
- playful
- restless
- direct

**J**

- creative
- broad-minded
- independent
- studious
- versatile
- idealistic
- unconventional
- sincere

**K**

- cooperative
- impartial
- friendly
- popular
- intellectual
- tactful
- self-indulgent
- sensitive

**L**

- ambitious
- hardworking
- cautious
- practical
- calm
- aloof
- possessive
- tenacious
HANDOUT 1–5

1. Is the Mississippi River longer or shorter than 500 miles? _________
   How long is it? _______ miles

2. Is the population of Argentina greater or smaller than 2 million? _________
   What is the population? ________

HANDOUT 1–5

1. Is the Mississippi River longer or shorter than 3000 miles? _________
   How long is it? _______ miles

2. Is the population of Argentina greater or smaller than 100 million?
   What is the population? ________
HANDOUT 1–6a

*Respond to each of the following statements with a number from 1 = strongly agree to 7 = strongly disagree.*

1. I oppose raising taxes.
2. The primary task of the government should be to keep citizens safe from terrorism and crime.
3. I regularly perform routine maintenance on my car.
4. I make it a practice to never lie.
5. Monogamy is important to me.
6. People should wait to have sex until they are in a committed relationship.
7. My partner and I always use protection.
8. How often do you exercise?
   1. Infrequently  2. Occasionally  3. Often

Respond to each of the following statements with a number from 1 = strongly agree to 7 = strongly disagree.

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<tbody>
<tr>
<td>1.</td>
<td>I would be willing to pay a few extra dollars in taxes to provide high-quality education to all children.</td>
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<td>2.</td>
<td>The primary task of the government should be to preserve citizens’ rights and civil liberties.</td>
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<td>3.</td>
<td>Sometimes I don’t change the oil in my car on time.</td>
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<td>4.</td>
<td>Like all human beings, I occasionally tell a white lie.</td>
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<td>5.</td>
<td>Sexual freedom is important to me.</td>
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<td>6.</td>
<td>Sex can strengthen a new relationship.</td>
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<td>7.</td>
<td>Although I know it is important, sometimes I don’t practice safe sex.</td>
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<td>8.</td>
<td>In the last six months, how often have you engaged in at least 20 minutes of aerobic activity?</td>
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1. Almost never
2. Less than once/week
3. Once/week
4. 2 times/week
5. 3 times/week
6. 4 times/week
7. More than 4 times/week

<table>
<thead>
<tr>
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<td>39634 62349 74088 65564 16379 19713 39153 69459 17986 24537</td>
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A new study of the brain suggests a biological difference between homosexual and heterosexual men.

The debate over the roots of homosexuality has been going on a long time, but this finding "suggests a biological phenomenon," says neurologist Dennis Landis, Case Western Reserve University, Cleveland, in comments accompanying the study in today's Science.

It might explain "why male homosexuality is present in most human populations, despite cultural constraints."

In a study of the brain cells from 41 people, 25 of whom had died from AIDS, certain brain cells of heterosexual men had nuclei that were more than twice as large as those in homosexual men, says researcher Simon LeVay, Salk Institute for Biological Studies.

The difference was apparently not caused by AIDS, because it was constant in a comparison of cells from heterosexual and homosexual male AIDS victims. LeVay also found homosexual men's cells similar in size to women's.

Robert Bray, spokesman for National Gay and Lesbian Task Force, called the study "fascinating."

"If used ethically, (it) can shed light on human sexuality and prove what we've always believed—being a gay or lesbian is not a matter of choice.

"Used unethically, the data could reinforce the political agenda of anti-gay groups that advocate 'curing' or 'repairing' homosexuals—the notion that gay people could be made straight by tweaking a chromosome here or readjusting a cell there."


1. What conclusion does this article imply? What statements in the article suggest this conclusion?
2. Is this conclusion warranted by the study described? Why or why not?
3. Is the title an accurate summary of the study described? Why or why not?
4. Can this study "prove . . . being gay or lesbian is not a matter of choice," as the task force spokesman suggests? Why or why not?
5. What questions do you have after reading this article?
6. If you had the power to create guidelines for the press's reporting of a research study, what would you recommend?
A researcher wanted to find out whether the stereotyped view of female emotionality is actually verified by psychological research. She found 20 different research studies on the issue published between 1984 and 1988. Each study examined some specific situation in which either males or females were observed to be quite emotional or unemotional. By scrutinizing the collective results of all 20 studies, she hoped to gain a more complete picture of the relationship between gender and emotionality. The results of the 20 studies are presented below.

<table>
<thead>
<tr>
<th>Study #</th>
<th>Were the Subjects Women?</th>
<th>Were the Subjects Emotional?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>2</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>3</td>
<td>No</td>
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<td>12</td>
<td>Yes</td>
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<td>13</td>
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<tr>
<td>14</td>
<td>Yes</td>
<td>No</td>
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<td>15</td>
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<td>19</td>
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<td>No</td>
</tr>
<tr>
<td>20</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Considering the above, is ability to predict the outcome of a study about emotionality aided by knowing whether the subjects were women or men? In other words, in these 20 studies, were women more or less likely to be emotional than men? Regardless of your own personal ideas about female emotionality, what do you think the researcher found (check one)?

- Women were much more likely to be emotional than were men.
- Women were somewhat more likely to be emotional than were men.
- Women were slightly more likely to be emotional than were men.
- Women and men were equally likely to be emotional.
- Women were slightly less likely to be emotional than were men.
- Women were somewhat less likely to be emotional than were men.
- Women were much less likely to be emotional than were men.
## Presidents’ Ages at the Time of Inauguration

<table>
<thead>
<tr>
<th>President</th>
<th>Age</th>
<th>President</th>
<th>Age</th>
<th>President</th>
<th>Age</th>
</tr>
</thead>
<tbody>
<tr>
<td>Washington</td>
<td>57</td>
<td>Lincoln</td>
<td>52</td>
<td>Hoover</td>
<td>54</td>
</tr>
<tr>
<td>J. Adams</td>
<td>61</td>
<td>A. Johnson</td>
<td>56</td>
<td>F. D. Roosevelt</td>
<td>51</td>
</tr>
<tr>
<td>Jefferson</td>
<td>57</td>
<td>Grant</td>
<td>46</td>
<td>Truman</td>
<td>60</td>
</tr>
<tr>
<td>Madison</td>
<td>57</td>
<td>Hayes</td>
<td>54</td>
<td>Eisenhower</td>
<td>61</td>
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<tr>
<td>Monroe</td>
<td>58</td>
<td>Garfield</td>
<td>49</td>
<td>Kennedy</td>
<td>43</td>
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<tr>
<td>J. Q. Adams</td>
<td>57</td>
<td>Arthur</td>
<td>51</td>
<td>L. Johnson</td>
<td>55</td>
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<tr>
<td>Jackson</td>
<td>61</td>
<td>Cleveland</td>
<td>47</td>
<td>Nixon</td>
<td>56</td>
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<tr>
<td>Van Buren</td>
<td>54</td>
<td>B. Harrison</td>
<td>55</td>
<td>Ford</td>
<td>61</td>
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<tr>
<td>W. H. Harrison</td>
<td>68</td>
<td>Cleveland</td>
<td>55</td>
<td>Carter</td>
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<tr>
<td>Tyler</td>
<td>51</td>
<td>McKinley</td>
<td>54</td>
<td>Reagan</td>
<td>69</td>
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<tr>
<td>Polk</td>
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<td>T. Roosevelt</td>
<td>42</td>
<td>Bush</td>
<td>64</td>
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<tr>
<td>Taylor</td>
<td>64</td>
<td>Taft</td>
<td>51</td>
<td>Clinton</td>
<td>46</td>
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<tr>
<td>Fillmore</td>
<td>50</td>
<td>Wilson</td>
<td>56</td>
<td>Bush</td>
<td>54</td>
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<tr>
<td>Pierce</td>
<td>48</td>
<td>Harding</td>
<td>55</td>
<td></td>
<td></td>
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<tr>
<td>Buchanan</td>
<td>65</td>
<td>Coolidge</td>
<td>51</td>
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</tr>
</tbody>
</table>

1. Display the above data in a bar graph, placing age at inauguration on the vertical axis and the total number of presidents at each age on the horizontal axis. (Hint: Use bars with intervals of five years each, beginning with 40–45 years and ending with 65–70. Use numbers from 0 to 16 on the vertical axis.)

2. Calculate the mean, median, and mode for the presidents’ ages.

3. Calculate the variance and standard deviation of the presidents’ ages.
HANDOUT 1–11

Student Survey

Please provide the information requested. Your personal responses will remain anonymous, so please answer all questions accurately and honestly.

1. Your age: ________________
2. Your sex (circle one): MALE  FEMALE
3. Your high school GPA: ________________
4. Your college GPA: ________________
5. Your SAT score: ________________
6. Annual family income: ________________
7. Your height (in inches): ________________
8. Your weight (in pounds): ________________
9. Your birth order (indicate “1” if only child): ________________
10. Total number of siblings: ________________
11. Your shoe size: ________________
12. Do you smoke cigarettes (circle one)? YES  NO
13. Do you consume alcohol (circle one)? YES  NO
   If so, how many drinks per week? ________________
14. Average number of hours you study per week: ________________
15. Average number of hours you sleep per night: ________________
16. Average number of hours you watch TV per week: ________________
17. Average number of hours you exercise per week: ________________
Random Samples

1. At the end of the first two weeks of the baseball season, newspapers start publishing the top ten batting averages. The leader after the first two weeks normally has a batting average of .450 or higher. Yet no major league baseball player has ever finished the season with a better than .450 average. What do you think is the most likely explanation for the fact that batting averages are higher early in the season?

2. David L., a senior in high school on the East Coast, was planning to go to college. He had compiled an excellent record in high school and had been admitted to his two top choices: a small liberal arts college and an Ivy League university. The two schools were about equal in prestige and were equally costly. Both were located in attractive East Coast cities, about equally distant from his hometown. David had several older friends who were attending the liberal arts college and several who were attending the Ivy League university. They were all excellent students like himself and had interests similar to his. The friends at the liberal arts college all reported that they liked the place very much and that they found it very stimulating. The friends at the Ivy League university reported that they had many complaints on both personal and social grounds and on educational grounds. David initially thought he would go to the smaller college. However, he decided to visit both schools himself for a day. He did not like what he saw at the private liberal arts college. The people he met seemed cold and unpleasant; a professor seemed abrupt and uninterested in him; and he did not like the “feel” of the campus. He did like what he saw at the Ivy League university. The people he met seemed vital, enthusiastic, and pleasant; the two professors he met took a personal interest in him; and he came away with a very pleasant feeling about the campus. Please say which school you think David should go to and why.
3. The personnel manager of a large firm had to select a new chief accountant. No one in the firm’s accounting office was qualified for the job, so an outside candidate had to be found. The job requirements were expertise and practical experience in accounting, organizational skills, and the ability to get along with and to lead other people. There were two candidates for the job: Mr. Simpson and Mr. Barker. Each had worked for a small firm previously, and they had about the same amount of experience in accounting. Both had letters of recommendation from two former employers. The personnel manager personally knew all the employers and trusted their judgment. Both letters on Mr. Simpson indicated that he was an excellent accountant and that his organizational skills (delegation of responsibility, regulation of paper flow, meeting deadlines) were fairly good. One letter said he was a fairly effective leader, but he did not get along with several members of his staff and, in fact, some actively disliked him. The other letter also expressed some fairly strong reservations about his ability to get along with the staff, but not about his leadership ability. Both letters on Mr. Barker indicated that he was an excellent accountant and that his organizational skills were quite good. Both letters stressed that he was an excellent leader and that he got along extremely well with almost all staff members. The personnel manager interviewed both men and introduced them to the twelve-member accounting staff at a half-hour get-acquainted session. Mr. Simpson seemed quite impressive, obviously intelligent, energetic, and good humored. He made a very solid impression on the personnel manager and on most of the staff members. Mr. Barker did not make such a good impression, either on the personnel manager or on the staff. He seemed intelligent enough, but somewhat ill-at-ease and awkward. Most of the staff wondered how easy he would be to get to know and to communicate with. Which candidate should the personnel manager pick and why? What are the most important things to take into consideration?

Source: Reprinted by permission of Professor Richard E. Nisbett.
1. Imagine that you are a golfer of above-average ability and that you have the opportunity to play the greatest golfer in the world (say Tiger Woods or Nick Price). If you want to maximize your slim chance of winning, how much golf would you elect to play, given the choices of 1, 18, 36, or 72 holes?

2. A certain town is served by two hospitals. In the larger hospital about 45 babies are born each day, and in the smaller hospital about 15 babies are born each day. Although the overall proportion of boys is about 50 percent, the actual proportion at either hospital may be greater or less than 50 percent on any day. At the end of a year, which hospital will have the greater number of days on which more than 60 percent of the babies born were boys?

   (a) the larger hospital
   (b) the smaller hospital
   (c) neither—the number of days will be about the same (within 5 percent of each other)

3. Imagine an urn filled with white and black balls. You know that two-thirds of the balls are one color and one-third are the other, but you don’t know which color predominates. One blindfolded person plunges a hand into the urn and comes up with 3 black balls and 1 white ball. Another uses both hands and comes up with 14 black balls and 10 white balls. Which sample provides the more convincing evidence that the urn contains more black balls than white balls?

   (a) the first, or 3:1 sample
   (b) the second, or 14:10 sample
   (c) they are equally convincing


**Human Morality Made Simple**

<table>
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<tr>
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</thead>
<tbody>
<tr>
<td>Immediate Family Members</td>
<td>Daughter</td>
<td>Almost exactly like you</td>
<td>Must be unbelievably nice and generous. Give it money. Devote your life to its well-being.</td>
<td>Y</td>
<td>N</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>Extended Family Members, Friends</td>
<td>Cousin</td>
<td>Very much like you.</td>
<td>Must be very kind. Help it if not too costly to yourself. Make sure never to harm it.</td>
<td>S</td>
<td>N</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>Community Members</td>
<td>Fellow American</td>
<td>Same customs, value system, TV shows</td>
<td>May only harm if you can gain by it (e.g., in business deals). No need to help it.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Outsiders</td>
<td>Foreigner</td>
<td>Looks different, acts weird</td>
<td>Note: This line need not be drawn geopolitically only. For example, if you view your racial group as your community, drop members of other races to “outsider” status. Can be mean to, if necessary. May kill, if wartime.</td>
<td>M</td>
<td>S</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>Pets and Primates</td>
<td>Dog</td>
<td>Not human, but anthropomorphized</td>
<td>Can harm, if for research. Can put it to sleep, if necessary. Can’t eat it.</td>
<td>M</td>
<td>S</td>
<td>S</td>
<td>S</td>
</tr>
<tr>
<td>Other Mammals</td>
<td>Deer</td>
<td>Different</td>
<td>Can kill, can eat. Pat it on the head.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other Animals</td>
<td>Fish</td>
<td>Very different</td>
<td>Can kill, can eat. Don’t pat it on the head.</td>
<td>N</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Invertebrates</td>
<td>Ladybug</td>
<td>G grossly different</td>
<td>Stomp on it, feel a little guilty.</td>
<td></td>
<td></td>
<td></td>
<td>Yech</td>
</tr>
<tr>
<td>Plants</td>
<td>Radish</td>
<td>Absolutely different</td>
<td>Destroy without a twinge of guilt.</td>
<td>N</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
</tbody>
</table>

Source: By Ruben Bolling, from his weekly comic strip “Tom the Dancing Bug.” Distributed by Quaternary Features, P.O. Box 72, New York, NY 10021. © 1991 R. Bolling. E-mail tomdbug@aol.com.
HANDOUT 1–15

Instructions: Your group is the Animal Care Committee for your university. It is the committee’s responsibility to evaluate and either approve or reject research proposals submitted by faculty members who want to use animals for research or instructional purposes in psychology, biology, or medicine. The proposals describe the experiments, including the goals and potential benefits of the research as well as any discomfort or injury that they may cause the animal subjects. You must either approve the research or deny permission for the experiments. It is not your job to suggest improvements on technical aspects of the projects, such as the experimental design. You should make your decision based on the information given in the proposal.

CASE 1
Professor King is a psychobiologist working on the frontiers of a new and exciting research area of neuroscience, brain grafting. Research has shown that neural tissue can be removed from the brains of monkey fetuses and implanted into the brains of monkeys that have suffered brain damage. The neurons seem to make the proper connections and are sometimes effective in improving performance in brain-damaged animals. These experiments offer important animal models for human degenerative diseases such as Parkinson’s and Alzheimer’s. Dr. King wants to transplant tissue from fetal monkey brains into the entorhinal cortex of adult monkeys; this is the area of the human brain that is involved with Alzheimer’s disease.

The experiment will use 20 adult rhesus monkeys. First, the monkeys will be subjected to ablation surgery in the entorhinal cortex. This procedure will involve anesthetizing the animals, opening their skulls, and making lesions using a surgical instrument. After they recover, the monkeys will be tested on a learning task to make sure their memory is impaired. Three months later, half of the animals will be given transplant surgery. Tissue taken from the cortex of monkey fetuses will be implanted into the area of the brain damage. Control animals will be subjected to sham surgery, and all animals will be allowed to recover for 2 months. They will then learn a task to test the hypothesis that the animals having brain grafts will show better memory than the control group.

Dr. King argues that this research is in the exploratory stages and can only be done using animals. She further states that by the year 2004 about 3 million Americans will have Alzheimer’s disease and that her research could lead to a treatment for the devastating memory loss that Alzheimer’s victims suffer.

CASE 2
Dr. Fine is a developmental psychobiologist. His research concerns the genetic control of complex behaviors. One of the major debates in his field concerns how behavior develops when an animal has no opportunity to learn a response. He hypothesizes that the complex grooming sequence of mice might be a behavior pattern that is built into the brain at birth, even though it is not expressed until weeks later. To investigate whether the motor patterns involved in grooming are acquired or innate, he wants to raise animals with no opportunity to learn the response. Rearing animals in social isolation is insufficient because the mice could teach themselves the response. Certain random movements could accidentally result in the removal of debris. These would then be repeated and could be coordinated into the complex sequence that would appear to be instinctive but would actually be learned. To show that the behaviors are truly innate, he needs to demonstrate that animals raised with no opportunity to perform any grooming-like movements make the proper movements when they are old enough to exhibit the behavior.

Dr. Fine proposes to conduct the experiment on 10 newborn mice. As soon as the animals are born, they will be anesthetized and their front limbs amputated. This procedure will ensure that they will not be reinforced for making random grooming movements that remove debris from their bodies. The mice will then be returned to their mothers. The animals will be observed on a regular schedule using standard observation techniques. Limb movements will be filmed and analyzed. If grooming is a learned behavior, then the mice should not make grooming movements with their stumps as the movements will not remove dirt. If, however, grooming movements are innately organized in the brain, then the animals should eventually show grooming-like movement with the stumps.

In his proposal, Dr. Fine notes that experimental results cannot be directly applied to human behavior. He argues, however, that the experiment will shed light on an important theoretical debate in the field of developmental psychobiology. He also stresses that the amputations are painless and the animals will be well treated after the operation.
HANDOUT 1–15 (continued)

CASE 3
Your university includes a college of veterinary medicine. In the past, the veterinary students have practiced surgical
techniques on dogs procured from a local animal shelter. However, there have been some objections to this practice,
and the veterinary school wants the approval of your committee to continue this practice. They make the following
points.

1. Almost all of these animals will eventually be killed at the animal shelter. It is wasteful of life to breed ani-
mals for the vet school when there is an ample supply of animals that are going to be killed anyway, either
because their owners do not want them or because they are homeless.
2. It costs at least 10 times as much to raise purebred animals for research purposes; this money could be better
used to fund research that would benefit many animals.
3. Research with dogs from animal shelters and the practice surgeries will, in the long run, aid the lives of ani-
mals by training veterinarians and producing treatments for diseases that afflict animals.

A local group of animal welfare activists has urged your committee to deny the veterinary school’s request. They
argue that the majority of these animals are lost or stolen pets, and it is tragic to think that the dog you have grown to
love will wind up on a surgical table or in an experiment. Furthermore, they claim that as people become aware that
animals taken to shelters may end up in research laboratories, they will stop using the shelters. Finally, the activists
point out that in countries such as England, veterinary students do not perform practice surgery; they learn surgical
techniques in an extensive apprenticeship.

CASE 4
The Psychology Department is requesting permission from your committee to use 10 rats per semester for demonstra-
tion experiments in a physiological psychology course. The students will work in groups of three; each group will be
given a rat. The students will first perform surgery on the rats. Each animal will be anesthetized. Following standard
surgical procedures, an incision will be made in the scalp and two holes drilled in the animal’s skull. Electrodes will
be lowered into the brain to create lesions on each side. The animals will then be allowed to recover. Several weeks
later, the effects of destroying this part of the animal’s brain will be tested in a shuttle avoidance task in which the
animals will learn when to cross over an electrified grid.

The instructor acknowledges that the procedure is a common demonstration and that no new scientific information
will be gained from the experiment. He argues, however, that students taking a course in physiological psychology
must have the opportunity to engage in small animal surgery and to see firsthand the effects of brain lesions.

Discussing animal rights and animal research in the classroom. Teaching of Psychology, 17, 90–94.