Thinking Critically With Psychological Science

OUTLINE OF RESOURCES

NOTE: Several activities (indicated by a †) may be appropriate for use with topics other than the one for which they were originally intended. These are listed with their alternative uses at the end of this outline.

*Titles in LaunchPad are not described within the core resource unit. They are listed, with running times, in the Lecture Guides and described in detail at www.macmillanhighered.com/launchpad/(followed by myers11e, myers11einmodules, exploring10e, exploring10einmodules, or pel4e, depending on which text you are using).

Correlation

Classroom Exercises: Correlations and Predicting Exam Performance† (p. 24)
Correlating Test-Taking Time and Performance† (p. 24)
Positive and Negative Correlatiois (p. 25) **NEW**
Displaying Scatterplots (p. 26) **NEW**
Illusory Correlation† (p. 26) **REVISED**
Illusory Correlation Demonstration (p. 27) **NEW**
The Power of Disconfirming Evidence: Do Dreams Predict the Future?† (p. 27)

PsychSim 6: Correlation† (p. 24)

Lecture/Discussion Topics: Understanding Correlation† (p. 24)
Misinterpreting Correlations† (p. 28)

Classroom Exercise/Student Project: Correlation Does Not Imply Causation† (p. 29) **NEW**

Television Show: Homer Simpson and Illusory Correlation† (p. 26)

*LaunchPad: Correlation and Causation**

Experimentation

Classroom Exercises: Introducing the Experiment (p. 30)
Random Assignment (p. 31)
Main Effects and Interactions or "It All Depends"† (p. 31)
Field and Laboratory Experiments† (p. 33) **UPDATED**
Psychological Research Methods (p. 34) (This activity brings together all the research methods) **NEW**

Student Projects/Classroom Exercises: The Placebo Effect (p. 31)
Identifying Variables and Groups and Correlational Versus Experimental Studies (p. 32) **NEW**

*LaunchPad: Does Self-Confidence Intimidate Others?**

Ethics and Personal Values in Psychology

Lecture/Discussion Topics: APA Guidelines for Ethical Conduct in the Care and Use of Nonhuman Animals in Research (p. 35) **NEW**
Invasion of Privacy (p. 36) **UPDATED**
Research Ethics (p. 36)
Psychology and Human Values (p. 37)
The Instructor's Perspective and Values (p. 38)

Classroom Exercises: Animal Rights (p. 35)
Teaching Ethics in the Introduction to Psychology Course: Research Methods (p. 37) **NEW**
Observing Versus Interpeting† (p. 38)

*LaunchPad: Ethics in Animal Research: The Sad Case of Boee the Chimp**
*Ethics in Human Research: Violating One's Privacy**
*Death of a Subject: The Ethics of Mental Health Research**

Statistical Concepts and Causation

Lecture/Discussion Topics: The Case for Statistical Analysis (p. 38)
The Law of Large Numbers and the Gambler's Ruin† (p. 40)
Differences Between Groups† (p. 41) **UPDATED**

Classroom Exercises: Teaching Statistical Concepts (p. 39)
More Cases Are Better Than Fewer† (p. 40)

Student Project: Organizing and Interpreting Data (p. 39)

Classroom Exercise/Student Project: Describing Data (p. 40)

PsychSim 6: Descriptive Statistics (p. 40)

MULTIPLE-USE ACTIVITIES (These activities, listed previously, also apply to the topics identified here.)

Intuition and Commonsense Thinking:
The following items highlight, primarily, resources designed to help students develop critical thinking skills and/or the ability to accurately interpret statistical information. However, these skills necessarily rely upon the ability to resist "common sense," intuitive gut-reactions (or, at the very least, to delay responding on their basis) until alternative explanations and the totality of evidence have been considered. As you engage your students with the items below, it may be fruitful for you to discuss with them how or why critical thinking helps us avoid the pitfalls and "perils" of intuition when we collect and examine information about behavior.

Lecture/Discussion Topics: Your Teaching Strategies and Critical Thinking (p. 11)
The Power of Disconfirming Evidence: Do Dreams Predict the Future? (p. 27)
Observing Versus Interpreting (p. 38)
The Law of Large Numbers and the Gambler's Ruin (p. 40)
Differences Between Groups (p. 41)

Classroom Exercises: Critical Inquiry and Psychology (p. 11)
Field and Laboratory Experiments (p. 33)

Intuitive thinking sometimes leads us to misinterpret correlational relationships in a causal manner. When this happens, it is typically because we fail to take the time or effort to examine additional factors that may influence or explain the predictive relationship between two variables themselves. As you examine the nature of the specific positive and negative correlations described below, you may want to discuss the common cause-effect conclusions that people mistakenly draw from such correlational evidence.

Lecture/Discussion Topics: Understanding Correlation (p. 24)
Misinterpreting Correlations (p. 29)

Classroom Exercises: Illusory Correlation (p. 26)
Illusory Correlation Demonstration (p. 27)

Classroom Exercise/Student Project: Correlation Does Not Imply Causation (p. 29)

Television Show: Homer Simpson and Illusory Correlation (p. 26)

Descriptive and Experimental Methods:
The following items focus mainly on the understanding of statistical concepts. However, you can also use them to reinforce the important methodological differences among experimental and descriptive approaches to research. You may also use them as opportunities to discuss the implications that specific elements of research design have for the kinds of statistical methods that can be used to examine the data collected.

Classroom Exercises: More Cases Are Better Than Fewer (p. 40)
The Gambler's Fallacy (p. 9)

Statistical Concepts:
The following items focus mainly on the understanding of research methodologies but they may also be useful to you in discussing statistical concepts. You may also use them as opportunities to discuss the implications that specific elements of research design have on the kinds of statistical methods that can be used to examine the data collected.

Classroom Exercises: Correlations and Predicting Exam Performance (p. 24)
Correlating Test-Taking Time and Performance (p. 24)
Illusory Correlation (p. 26)
Illusory Correlation Demonstration (p. 27)
The Power of Disconfirming Evidence: Do Dreams Predict the Future? (p. 27)
Main Effects and Interactions or "It All Depends" (p. 31)

Student Project: Evaluating Media Reports of Research (p. 15)

PsychSim 6: Correlation (p. 24)

Lecture/Discussion Topics: Understanding Correlation (p. 24)
Misinterpreting Correlations (p. 28)

Television Show: Homer Simpson and Illusory Correlation (p. 26)

RESOURCES

Intuition, Common Sense, and Other Explanations of Behavior

Lecture/Discussion Topic: Misremembering the Causes of Behavior

We are all amateur psychologists, suggested Fritz Heider, who attempted to explain others' behavior (see the text discussion of social thinking). That need for a coherent world, however, sometimes leads to error.

You can extend your 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," said 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," suggested 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 . . . ?"

Hannigan, S. L., & Reinitz, M. T. (2001). A demonstration and comparison of two types of inference-based memory errors. *Journal of Experimental Psychology: Learning, Memory and Cognition, 27*, 931–940.

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 the next page.

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, inventor, puzzler, and artist Ivan Moscovich reported 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 has demonstrated 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 wood strip 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.

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 that the initial probability that the participant has the $1 is 1 in 3; the probability that the experimenter has it is 2 in 3. 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.

Cromer, A. (1993). *Uncommon sense: The heretical nature of science*. New York: Oxford Press.

Jaffe, E. (2004, May). What was I thinking? *APS Observer,* 24–26.

Kahneman, D. (2003). A perspective on judgment and choice. *American Psychologist, 58,* 697–720.

Kohn, A. (1992). Defying intuition: Demonstrating the importance of the empirical technique. *Teaching of Psychology, 19,* 217–219.

Moscovich, I. (2001). *1000 PlayThinks*. New York: Workman.

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.

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 6.5 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 about 933 square miles, considerably less than Rhode Island's 1545.

What if we allowed everyone to sit comfortably in 216 cubic feet (6 feet on a side)? The answer is that every human being on earth would fit comfortably into the Grand Canyon.

Finally, if we poured all human blood into a cube-shaped container, how wide would the tank be? About 955 feet. (Assume 6.5 billion people each with a gallon of blood. A cubic foot holds 7.5 gallons. 6.5 billion gallons equals about 870 million cubic feet of blood. 955 feet x 955 feet x 955 feet = 970 million cubic feet.)

Milgram, S. (1967, May). The small-world problem. *Psychology Today,* pp. 60–67.

Paulos, J. P. (1995). *A mathematician reads the newspaper.* New York: Basic Books.

vos Savant, M. (1996). *The power of logical thinking.* New York: St. Martin's Press.

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

You can expand upon a discussion of how what may seem to be an extraordinary event may have a chance-related explanation. As David Myers states, "An event that happens to but 1 in 1 billion people every day occurs about 7 times a day, 2500 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 stated, "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."

In his book *Intuition,* 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.

Charpak, G., & Broch, H. (2004). *Debunked!* Baltimore: Johns Hopkins University Press.

Myers, D. G. (2002). *Intuition: Its powers and perils.* New Haven, CT: Yale University Press.

Shermer, M. (2004, July 26). Miracle on probability street. Message posted at www.sciam.com/print_version.cfm?articleID=00094511-E068.

Biases in Thinking

Classroom Exercise: The Hindsight Bias and Predicting Research Outcomes

The tendency to exaggerate our 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 text discussion of limitations on everyday thinking.

Use Handout 1 (compliments of John Brink) as an 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 what the other half received, as you can see by comparing with the person next to you."

To illustrate the hindsight bias, have students in 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.

After the 2008 financial crisis in the United Kingdom and the United States, many people wondered why the experts did not see it coming. After all, the warning signs were there (Hindmoor & McConnell, 2013). For example, housing prices were skyrocketing; did they not realize that the prices had nowhere to go but down? The warning signs are obvious once you know the outcome.

Medicine is rife with examples of the hindsight bias in action. For example, to help physician students or residents improve their diagnostic skills, they may be given all the details about a patient who has died, except the actual cause of death. The student spends a

week or so studying the case, including all the possible diagnoses, and presents his or her diagnosis, which is usually wrong, to the assembled medical staff. The person who did the autopsy then reveals the actual cause of death, which is often different from what the resident guessed since the cases to be presented are, by design, difficult. While the point of the exercise is to help everyone with differential diagnoses, the staff fall prey to the hindsight bias; they cannot believe that the resident missed such an easy diagnosis.

Gordon Wood (1984) has suggested 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. Hindsight bias is front and center in medical malpractice lawsuits, for example. Jurors are asked to imagine that they do not know the outcome, go back in time, and determine if the physician acted appropriately (Arkes, 2013). 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. They may become less susceptible to the hindsight bias.

Arkes, H.R. (2013). The consequences of the hindsight bias in medical decision making. *Current Directions in Psychological Science, 22*(5), 356–360. doi: 10.1177/0963721413489988.

Hindmoor, A. & McConnell, A. (2013). Why didn't they see it coming? Warning signs, acceptable risks and the global financial crisis. *Political Studies, 61*(3), 543-560. doi: 10.1111/j.1467-9248.2012.00986.x.

Memmot, M. (2003, February 3). Astronauts face high degree of danger. *USA Today,* p. 2A.

Wood, G. (1984). Research methodology: A decision-making perspective. In A. Rogers & C. Scheirer (Eds.), *The G. Stanley Hall lecture series*, Vol. 4. Washington, DC: American Psychological Association.

Classroom Exercise/Student Project: The Propensity Effect

The hindsight bias is one of the better-known and most heavily researched biases in human judgment and decision making. It's lesser-known opposite, the "propensity effect," has been identified and studied only fairly recently by a handful of researchers. Defined by Neal Roese and Kathleen Vohs as a "hyperconfidence" of "impending events' outcomes," the propensity effect is the experience of just knowing what is about to happen. It seems to be more prevalent when people visually process information (especially if it includes the apparent trajectory of objects or motion). For example, when watching computer-animated graphs of trends in consumer purchases, retailers may overestimate predicted sales during the upcoming holidays. Or jurors watching videos of vehicles traveling across an intersection may judge an automobile accident on that road to be more likely than if they simply viewed a static photograph.

To help students understand this propensity effect and how it can increase the likelihood of hindsight bias, ask them to find examples in which information is presented in a way that might lead to a propensity effect. Have them hypothesize about which specific elements of the presentation would create a propensity effect. How could they test those hypotheses? How could they prevent decision makers from being unduly influenced by the propensity effect? These and other questions could be used in out-of-class writing assignments or to generate in-class discussion.

Roese, N. J. & Vohs, K. D. The visualization trap. (2010, May). *Harvard Business Review, 88*(5), 26.

Roese, N. J., Fessel, F., Summerville, A., Kruger, J., & Dilich, M. A. (2010, May). The propensity effect: When foresight trumps hindsight. *Psychological Science, 17*(4) 305-310. doi: 10.1111/j.1467-9280.2006.01703.x.

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 in the Lecture Guides, 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 2 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 ($50 \times 5 \times 0.02 = 5$). 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 following correct answers. Overconfidence will be obvious.

1. 3.6 million square miles
2. 22.68 million people
3. 385 deaths
4. 14,306 female psychiatrists
5. 437 plants with 372 GW capacity and 68 with 65 GW capacity.

c. The Thinking and Language unit in these resources contains additional activities for demonstrating the overconfidence phenomenon. The specific activity accompanying Handout 5 in that unit 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. If you discuss the normal curve in class, you can anticipate that discussion 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?"

Christopher Cerf and Victor Navasky provided 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 1920–1921 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, manufactures of vacuum cleaners, 1955)

Another 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.

Benjamin, L.T., Nodine, B.F., Ernst, R.M., & Blair Broeker, C. (Eds.) (1999). *Handbook for the teaching of psychology* (Vol. 4). Washington, DC: American Psychological Association.

Cerf, C., & Navasky, V. S. (1998). The experts speak: The definitive compendium of authoritative misinformation. New York: Villard.

Jegerski, J. A. (1999). Probability distributions with real social judgment data. In L. T. Benjamin, B. F. Nodine, Vedantam, S. (2003, February 10). NASA discord may have had role in disaster. *Grand Rapids Press,* pp. A1, A4.

Lecture/Discussion Topic: Student Overconfidence

As noted earlier, overconfidence can affect many aspects of a student's life. An even more dramatic and lasting effect can result from overprecision— an excessive confidence that one knows the truth—according to Albert Mannes and Don Moore (2013). We change our estimates based on new information, but the more confident we are in our estimates, the more likely we are to ignore this new information. "The consequences of overprecision are profound. People frequently cut things too close—arriving late, missing planes, bouncing checks, or falling off one of the many 'cliffs' that present themselves in daily life. People also cling too fervently to beliefs that are poorly supported by evidence, adjusting their beliefs too little in light of the evidence or the consequences of being wrong" (Mannes & Moore, 2013). If students are overly confident in their studying techniques, are they less likely to adjust their techniques in light of evidence to the contrary? If students are overly confident in how long it will take them to write a paper, are they less likely to adjust their timetable in light of evidence that the task is more difficult than they had anticipated?

In one experiment, the more a lecturer appeared to have command of the material, the more confident students were in their own ability to master the material (Carpenter, Wilford, Kornell, & Mullaney, 2013). When the lecturer appeared organized, prepared, and knowledgeable, participants estimated that they would remember about half the material when in fact they remembered about a quarter. When the lecturer appeared

disorganized, unprepared, and unknowledgeable, participants estimated that they would remember about a quarter of the material, and that is in fact about what they remembered. For this study they showed a 1-minute video, presentation followed by a 10-minute distractor task, followed by a short quiz. Would the results hold with a longer presentation and a longer quiz? The larger question is whether, when given an opportunity to study, would students study less or leave less time to study if they perceive their lecturer to be organized, prepared, and knowledgeable?

Carpenter, S., Wilford, M., Kornell, N., and Mullaney, K. (2013). Appearances can be deceiving: instructor fluency in-creases perceptions of learning without increasing actual learning. *Psychonomic Bulletin and Review, 20*(6), 1350–1356. doi:10.3758/s13423-013-0442-z.

Mannes, A.E. & Moore, D.A. (2013). A behavioral demonstration of overconfidence in judgment. *Psychological Science, 24*(7), 1190–1197. doi: 10.1177/0956797612470700.

R. M. Ernst, & C. B. Broker (Eds.), Handbook for the teaching of psychology (Vol. 4). Washington, DC: American Psycho-logical Association. Vedantam, S. (2003, February 10). NASA discord may have had role in disaster. *Grand Rapids Press,* pp. A1, A4.

Classroom Exercise: Overconfidence and 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 *How 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 5000 and 10,000," but groaned when informed, "No, it's not between 5000 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 5000.

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.

Holt, J. (1995). *How children fail.* Cambridge, MA: Da Capo Press.

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 HTTHTH is more probable than HHHHHH. 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 three-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 alternative 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 alternatives, 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 bettors. 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.

Critical Thinking and the Scientific Method

Student Project/Classroom Exercise: Is Psychology a Science?

Jamie J. Peterson and Arturo Sesma, Jr. (2013) have developed a module for helping students develop scientific literacy in the context of psychological science. They created this activity to help students understand the science behind psychology,

This activity can be assigned to students individually or in pairs. First, ask students to read "Tall, Dark and Stable," *The Economist* (cited below), which summarizes a study conducted by David Kille, Amanda Forest, and Joanne Wood at the University of Waterloo, Canada (see below if you want to access the complete study). Students should summarize the article, then explain whether and why they think this is an example of scientific research.

Then, using PowerPoint, review for students the characteristics of a science and the scientific method and discuss experimental research ethics. PowerPoint slides can be downloaded from teachpsych.org/Resources/Documents/otrp/resources/peterson/Presentations%20without%20Answers.Final.pptx.

Returning to *The Economist* article, have individual students or pairs of students determine whether the researchers followed the scientific method in conducting their study. When they have reached their conclusions about the study, have the class come together first to describe the steps of this study, then to explain whether the researchers followed the scientific method. In conclusion, they should answer the question, "Is psychology a science?" with a resounding *Yes*.

As a further test of whether students understand what is needed for psychological research to be scientific, have them read the article "Parents can play active role . . . in making teens interested in math and science" (article cited below) and complete the Analyzing Media Reports of Psychological Research worksheet (Handout 3). Note that you should be explicit with students regarding your expectations on collaboration (that is, is it okay for students to work on the assignment in pairs, or do you expect them to complete it independently?).

ANI. Parents can play active role in making teens interested in math and science. (2012, July 12). Retrieved from in.news.yahoo.com/parents-play-active-role-making-teens-interested-math-050712211.html.

Kille, D., Forest, A., & Wood, J. (2013, January). Tall, dark, and stable: embodiment motivates mate sSelection preferences. *Psychological Science, 24,* 112–114 (first published on November 12, 2012).

Peterson, J. J., & Sesma, A., Jr. (2013). Scientific literacy in a psychology curriculum module. Society for the Teaching of Psychology. Retrieved from http://teachpsych.org/otrp/resources/index.php.

Tall, dark and stable. (2012, July 14). *The Economist.* Retrieved from www.economist.com/node/ 21558553.

Classroom Exercise: Exit Tickets

To master any subject, we 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, student projects, small-group discussions, and student debates are all designed to encourage active learning.

Exit tickets are a common formative assessment technique for use in modifying teaching and learning activities so students are better able to understand class material ("The Exit Ticket," n.d.). At the end of class, students respond to a question or two, in writing, about the material covered in that class session, perhaps tied to previously learned content. You could ask more global questions, such as "What was the most difficult content in today's class?" or "Identify at least one question you have about today's material." 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. In addition, or instead, you may employ an admission ticket whereby students arrive in class with a written response to a question you posed about the material to be read for that day's class session. Grading these can be simple: did it (1 point)/did not do it (0 points) or more elaborate: did it well (2 points)/did it (1 point)/did not do it (0 points).

> The Exit Ticket. (n.d.). *The Exit Ticket.* Retrieved November 16, 2013, from http://stemresources.com/static/tools/Assessments/Formative/ExitTicket/index.html.

Lecture/Discussion Topic: Your Teaching Strategies and Critical Thinking

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 and basketball streak-shooting. Explain that an important goal of the course is to teach questioning thinking that examines assumptions, appraises sources, discerns hidden values, evaluates evidence, and assesses conclusions.

Teaching Critical Thinking in Psychology: A Handbook of Best Practices (Dunn, Halonen, & Smith, 2008) is an excellent resource for the classroom. The book covers a wide range of topics, including why we should teach critical thinking in psychology and how to assess critical thinking. It also provides nine concrete examples of how to teach critical thinking to your students.

> Dunn, D., Halonen, J. S., & Smith, R. A. (2008). *Teaching critical thinking in psychology: A handbook of best practices.* Chichester, West Sussex: Wiley-Blackwell.

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 Lecture Guides that accompany your text provides many more; if you did not use it earlier, you may choose to do so now.

Classroom Exercise: A Psychic Reading

The question, "Can some people demonstrate ESP?" provides a good introduction to a discussion of the scientific attitude. Magician James Randi exemplifies skepticism because he has tested and debunked a variety of psychic phenomena.

Timothy Lawson suggested 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 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 explained 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 Internet contains a wealth of information. Check Facebook, Twitter, or whatever social media upstart is current at the time you are reading this. 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 humans.

> Lawson, T. J. (2003). A psychic-reading demonstration designed to encourage critical thinking. *Teaching of Psychology, 30,* 251–253.

Lecture/Discussion Topic: Critical Thinking

There are many sources of information about and activities regarding critical thinking. Here are some good ones.

Mark Forshaw's *Critical Thinking for Psychology: A Student Guide* (2012) comes with real-world examples and exercises appropriate for both discussions and assignments. He devotes an entire chapter to how a student can use critical thinking to get better grades.

Critical Thinking in Psychology (Sternberg, Roediger, & Halpern, 2006) explores critical thinking as it applies to conducting psychological research. How can we use critical thinking to evaluate the quality of a theory? Why is critical thinking important in clinical practice? While the focus of this book is on the conducting, reporting, and ethics of research, it will provide you with a wealth of material to share with your students throughout the course.

Psychobabble and Biobunk: Using Psychological Science to Think Critically About Popular Psychology (2011) is a collection of Carol Tavris' book reviews that demonstrate how critical thinking and psychological science can be put to good use when examining popular culture. She also tackles the perception that if we can see something in a brain scan, it is meaningful. Watch her 54-minute talk at the 2012 Association for Psychological Science Convention titled "How to Spot Pseudoneuroscience and Biobunk" (vimeo.com/45454490).

Dan Ariely's *Predictably Irrational: The Hidden Forces That Shape Our Decisions* examines how our expectations, emotions, social norms, and other invisible, illogical factors distort our reasoning abilities. How, for example, did we ever start spending $4.15 for a cup of coffee when, only a few years ago, we paid less than a dollar? Why do we splurge on a lavish meal but use coupons to save $0.25 on a can of soup? Why do we go back for second helpings at the unlimited buffet when our stomachs are already full? Why do our headaches continue after taking a 1-cent aspirin but go away when we take a 50-cent aspirin? Our wrongheaded decisions are neither random nor senseless, argues Ariely, but are systematic and predictable. Most important, Ariely explains how we can learn to think critically to make better decisions.

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 Ruscio's *Clear Thinking with Psychology: Separating Sense from Nonsense* introduces critical thinking tools for use in evaluating pseudoscientific claims. Each of the book's four major sections emphasizes a unique aspect of clear thinking that affects how well we evaluate claims. "Deception" introduces the ways by which others try to mislead us, "Self-Deception" describes the ways we unknowingly deceive ourselves, "Psychological Tricks" presents the mental shortcuts that often serve us well but require us to trade some accuracy for efficiency, and "Decision Making and Ethics" reviews ways for improving the accuracy of our everyday and professional judgments as well for making decisions that are consistent with sound ethical principles.

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 10 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 relate well to the contents of the Myers' texts. 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 Chapter 1, Smith provides the following guidelines for critical thinking that will in some cases 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 any 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: Metathoughts for Psychology* 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. The book contains many engaging exercises that challenge readers to improve their own strategies for inquiry and problem solving.

Robyn M. Dawes' *Everyday Irrationality* highlights the limits of human intuition. Subtitled *How pseudo-scientists, 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 (2001) 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 websites that offer critical evaluations of pseudoscientific claims.

Ariely, D. (2008). *Predictably irrational: The hidden forces that shape our decisions.* New York: HarperCollins.

Bell, J. (2005). *Evaluating psychological information: Sharpening your critical thinking skills* (4th ed.). Boston: Allyn & Bacon.

Bensley, D. A. (1998). *Critical thinking in psychology: A unified skills approach.* Belmont, CA: Wadsworth.

Dawes, R. M. (2003). *Everyday irrationality: How pseudoscientists, lunatics, and the rest of us systematically fail to think rationally*. Boulder, CO: Westview Press.

Forshaw, M. (2012). *Critical thinking for psychology: A student guide.* Hoboken: Wiley-Blackwell.

Levy, D. A. (2003). *Tools of critical thinking: Metathoughts for psychology*. Long Grove, IL: Waveland.

Lilienfeld, S. O., Lohr, J. M., & Morier, D. (2001). The teaching of courses in the science and pseudoscience of psychology: Useful resources. *Teaching of Psychology, 28,* 182–191.

Marton, J. (2006) *Fables for developing skeptical and critical thinking in psychology.* Victoria, BC: Trafford.

McBurney, D. H. (2002). *How to think like a psychologist: Critical thinking in psychology* (2nd ed.). Upper Saddle River, NJ: Prentice Hall.

Meltzoff, J. (1998). *Critical thinking about research: Psychology and related fields*. Washington, DC: American Psychological Association.

Myers, D. G. (2002). *Intuition: Its powers and perils*. New Haven, CT: Yale University Press.

Ruscio, J. (2006). *Clear thinking in psychology: Separating sense from nonsense* (2nd ed.). Pacific Grove, CA: Wadsworth.

Smith, R. A. (2002). *Challenging your preconceptions: Thinking critically about psychology* (2nd ed.). Belmont, CA: Wadsworth.

Sternberg, R. J., Roediger, H. L., & Halpern, D. F. (20076). *Critical thinking in psychology.* Cambridge, England: Cambridge University Press.

Tavris, C. (2011). *Psychobabble and biobunk: Using psychological science to think critically about popular psychology.* Upper Saddle River, NJ: Prentice Hall.

PsychSim 6: Understanding Psychological Research

This activity explains some of the major pitfalls in designing a research study. The student reviews the basic methodology used in psychological research, then engages in an interactive exrcise that tests his or her ability to identify methodological flaws involving sampling problems, experimenter bias, lack of a comparison group, and causal inferences from correlational data.

Classroom Exercise: Astrology and the Scientific Method

Roger Ward and Anthony Grasha provided 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 on the next page will help those who do not even know their sign).

Briefly review the text treatment of the scientific method, particularly the role of hypothesis testing. Next, ask your students to generate hypotheses based on assumptions they believe astrologers make about human behavior. Write each one on the board and note that hypotheses should be testable. If students have not mentioned the hypothesis that personality types are associated with particular zodiac signs, suggest it to them. Challenge the class to test whether this is accurate.

Handout 4a contains the personality profiles associated with the signs of persons born between March 21 and September 22; Handout 4b applies to those born after September 22 and before March 21. Give each student the profiles appropriate to his or her birthdate (6 instead of 12 profiles are provided to save time and to illustrate a potential flaw in the design when the data are analyzed). Then ask students to select the personality profile that best describes them and to write the letter

of that profile on a separate sheet of paper. Tell them to read each profile carefully and to make a judgment on the basis of the entire description.

After all students have made a selection, write the correct zodiac signs for each letter code on the board (the descriptions come from popular astrology books).

E Aries (March 2–April 19)
B Taurus (April 20–May 20)
C Gemini (May 2–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)

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.

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.

Ward, R. A., & Grasha, A. F. (1986). Using astrology to teach research methods to introductory psychology students. *Teaching of Psychology, 13,* 143–145.

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 strategy (descriptive, correlational, or experimental) to test the hypothesis. (You might want to save this project until after you've discussed the strategies.) If the method is experimental, they can identify independent and dependent variables and specify operational definitions. Have students form small groups, with each group thinking 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* as a useful resource; Parker's *Rules of Thumb 2* is also available.

Parker, T. (1990). *Never trust a calm dog.* New York: HarperCollins.

Parker, T. (1987). *Rules of thumb 2*. Boston: Houghton Mifflin.

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 exercises provide practice in understanding the distinction between correlation and causation; have students do it individually, in small groups, or as an entire class. You may want to hold this until after you have discussed correlation.

Jon Mueller and Heather Coon (2013b) have designed an introductory psychology course around scientific literacy. The course structure provides scaffolding to help students gain the skills necessary to evaluate scientific claims in the media. In one assignment,

students are given an article ("Diet of fish 'can prevent' teen violence") to read, which you can adapt for your class. Students then decide whether the title is descriptive, correlational, or causal and explain their reasoning. Several questions will further deepen their understanding of the research: What method(s) did the researchers use to test the hypothesis? Explain. Is the article title justified by the research results? Explain."

In another assignment, students find articles in the print or electronic media that make a similar type of claim. Students should not use claims presented in the text or on the course website. They can either attach a copy of the source material (for example, an advertisement, article, or website page) or write a brief description of it. They should identify the evidence that is used to support the claim and explain whether the claim is justified based on the evidence.

Mueller's website (2013) provides many examples of articles from the media, and he often includes links to the original research from which the media articles were drawn.

In *Rival Hypotheses*, Schuyler Huck and Howard Sandler (1979) 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. Four examples from this book can be found at web.pdx.edu/~stipakb/download/PA555/ThreatsToValidity.htm.

Handout 5 provides a final challenging opportunity for students (either individually or in small groups) to compare a media report with an abstract of the research on which it was based. Specifically, ask students to compare and contrast the title of the media report with the research evidence (again, a causal relationship is based on correlational data). What alternative explanations can they offer for the correlation between early television exposure and subsequent problems in children? In a full-class discussion, you might also ask students what factors might have contributed to the journalist's making the causal claim.

Interestingly, you might quote from the authors' own discussion of their research findings: "[W]e cannot draw causal inferences from these associations. It could be that attentional problems lead to television viewing rather than vice versa. . . . It is also possible that there are characteristics associated with parents who allow their children to watch excessive amounts of television that account for the relationship between television viewing and attentional problems. For example, parents who were distracted, neglectful, or otherwise preoccupied might have allowed their children to watch excessive amounts of television in addition to having created a household environment that promoted the development of attentional problems" (p. 712).

Christakis, D. A., Zimmerman, F. J., DiGiuseppe, D. L., & McCarty, C. A. (2004). Early television exposure and subsequent attentional disorders in children. *Pediatrics, 113,* 708–713.

Connor-Greene, P. A. (1993). From the laboratory to the headlines: Teaching critical evaluation of press reports of research. *Teaching of Psychology, 20*(3), 167–169.

Hinsliff, G. (2003, September 14). Diet of fish 'can prevent' teen violence. *The Guardian*. Retrieved from www.theguardian.com/politics/2003/sep/14/science.health

Huck, S. W., & Sandler, H. M. (1979). *Rival hypotheses*. New York: HarperCollins.

Mueller, J. F. (2013a, September 1). *Correlation or Causation?* Retrieved November 16, 2013, from jfmueller.faculty.noctrl.edu/100/correlation_or_causation.htm.

Mueller, J. F., & Coon, H. M. (2013b). Undergraduates' ability to recognize correlational and causal language before and after explicit instructiont. *Teaching of Psychology, 40*(4), 288-293. doi: 10.1177/0098628313501038.

Methods of Inquiry in Psychology

Descriptive Methods

Lecture/Discussion Topic: Case Studies

Mark Leary provides an excellent review of the uses and limitations of case studies. 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, 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, par-

ticularly 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.

Case studies have at least two important limitations. 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.

Leary, M. (2007). *Introduction to behavioral research methods* (5th ed.). Boston: Allyn & Bacon.

Lecture/Discussion Topic: The Power of Vivid Cases

The temptation to generalize from a few unrepresentative but vivid cases is nearly irresistible. You might cite two studies by Richard Nisbett and his colleagues to reinforce this point. In the first, 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 verbalized 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.

John de Wit, Enny Das, and Raymond Vet (2008), in an example from the Netherlands, explored using our tendency to be influenced by the power of vivid cases for good, in this case to get a vaccination. They recruited men who have sex with men to respond to an online study. Half the participants received statistical evidence about the risk of contracting hepatitis B; the other half listened to someone with hepatitis B talk about his disease. Participants who listened to the person with hepatitis B were more likely to say that they intended to get the vaccine. (Thank you to Susan Nolan [Seton Hall University] for suggesting this article.)

Borgida, E., & Nisbett, R. (1977). The differential impact of abstract vs. concrete information on decisions. *Journal of Applied Social Psychology, 7,* 258–271.

De Wit, J. F., Das, E., & Vet, R. (2008). What works best: Objective statistics or a personal testimonial? An assessment of the persuasive effects of different types of message evidence on risk perception. *Health Psychology, 27*(1), 110-115. doi: 10.1037/0278-6133.27.1.110.

Hamill, R., Wilson, T., & Nisbett, R. (1980). Insensitivity to sample bias: Generalizing from atypical cases. *Journal of Personality and Social Psychology, 39,* 578–589.

Classroom Exercise: Finding the Good and Bad in Case Studies

As the text notes, case studies may be misleading because a single case may be atypical. To help students refine their critical thinking about the scientific usefulness and limitations of case studies, have them work together to analyze some psychological case studies. Select a case study or two that is related to topics of

interest to you and your students (see some suggested case studies below). Then, have students form small groups of four or five and generate detailed descriptions about what psychologists could learn from the case studies. For example:

- What information from the case studies could be used to generate hypotheses?
- What uncontrolled variables or other mitigating circumstances may have contributed to the information that is presented about the specific cases?
- How could the cases help suggest design elements for future experimental research?
- What else would students want to know about the cases?

You can ask each group of students to consider the entire list of questions or assign just one question to each group. You may also want to add questions to the list.

Suggested case studies:

Cooper, S. E., Owen Nieberding, A., & Wanek, R. A. (2013). Successfully restructuring an executive leadership team: A case study in change management. *Consulting Psychology Journal: Practice and Research, 65*(2), 164-175. doi: 10.1037/a0033610.

Gasman, M., Kim, J., & Nguyen, T. (2011). Effectively recruiting faculty of color at highly selective institutions: A school of education case study. *Journal of Diversity in Higher Education, 4*(4), 212-222. doi: 10.1037/a0025130.

Hartmann, W. E., & Gone, J. P. (2012). Incorporating traditional healing into an urban American Indian health organization: A case study of community member perspectives. *Journal of Counseling Psychology, 59*(4), 542-554. doi: 10.1037/a0029067.

Levenson, R. W., Ekman, P., & Ricard, M. (2012). Meditation and the startle response: A case study. *Emotion, 12*(3), 650-658. doi: 10.1037/a0027472.

Snyder, D. K., Balderrama-Durbin, C., & Fissette, C. L. (2012). Treating infidelity and comorbid depression: A case study involving military deployment. *Couple and Family Psychology: Research and Practice, 1*(3), 213-225. doi: 10.1037/a0029919.

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 school's dining facility as an introductory psychology laboratory. This environment provides a rich source of interesting behavior to study and it requires no financial support. If your institution does not have a dining hall or dining hall–equivalent, any public space would work, such as a library or a sports facility. The observations and research questions would be different, but the concept is the same.

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 class in school. 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 class in school) 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 four to six students and 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 [MB] 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 next class. 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 classes.

Dining hall 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.

Koschmann, N., & Wesp, R. (2001). Using a dining facility as an introductory psychology research laboratory. *Teaching of Psychology, 28,* 105–108.

Lecture/Discussion Topic: Surveys, Evaluation Apprehension, and Naturalistic Observation

A potential problem with survey research is respondents' apprehension about being evaluated. They may provide the questioner with the socially appropriate rather than an honest response. In other cases, their retrospective accounts are simply rosy, reflecting a self-serving bias. Naturalistic observation can correct misleading survey research results.

For example, in one observational study, the American Society for Microbiology (ASM) reported that slightly more than three-quarters of men and women (77 percent) washed their hands in public restrooms. (This represented a 6 percent decline from a similar study conducted two years earlier in 2005.) At the same time, in a separate telephone survey, 92 percent of adults reported that they wash their hands every time they use a public restroom.

The observational research further indicated that women are more likely than men to wash their hands. Observing 6076 adults in four cities at six different locations, researchers found that 88 percent of the women but only 66 percent of the men washed their hands. In the telephone survey, 96 percent of women and 89 percent of men reported that they wash their hands every time they use a public bathroom.

Science Daily (September 18, 2007). Hygiene habits stall: public handwashing down. Retrieved October 29, 2007 from www.sciencedaily.com/releases/2007/09/070917112526.htm.

Classroom Exercise: The Wording of Survey Questions

Handout 6 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 with those who are provided "anchors" of 500 miles and 2 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. For example, the Mississippi River is actually 2348 miles, and the population of Argentina is more than 40 million.

Laura Madson (2005) designed Handouts 7a and 7b to initiate a more detailed class discussion of the importance of the proper wording of survey questions. At the end of the class session before discussing wording effects, randomly distribute a copy of Handout 7a or 7b 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, show students the mean score for 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 that 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 reframed 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 numbers or words used. When Michigan residents were asked, "Does Michigan spend too much, too little, or the right amount on prisons and corrections?" 38.4 percent indicated that the state spent "too much" and 35.4 percent said "not enough." However, when others were asked whether spending $1.3 billion (the actual amount spent) on prisons and corrections was too much, too little, or the right amount, 54.9 percent indicated this was "too much" and 14 percent stated it was "not enough." When a third group was asked about an expenditure of $23,700 per prisoner (again, the actual amount spent), 73.5 percent stated this was "too much," while only 6 percent indicated it was "not enough."

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 agreed that "The problems faced by Blacks were brought on by Blacks themselves." When interviewed by Blacks, only 46 percent agreed. When interviewed by a man, 64 percent of women agreed 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 agreed.

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 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 people 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 10 specific foreign aid initiatives, respondents favored increased spending in six initiatives and keeping the spending the same in the other four. For another 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 "forbid-

ding" 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 those questioned favored such an amendment. What accounted for the difference? The *New York Times*/CBS poll did not give respondents opposed to gay marriage any option other than a constitutional amendment. They asked, "Would you favor or oppose an amendment to the Constitution that would allow marriage ONLY between a man and a woman?" The Pew Center asked, "Do you strongly favor, favor, oppose, or strongly oppose allowing gays and lesbians to marry legally?" Those who opposed gay marriage were then asked, "Should the U.S. Constitution be amended to ban gay marriage, or is it enough to prohibit gay marriage by law without changing the Constitution?" Ask your class: Which approach better captured Americans' attitudes? Similarly, when respondents were asked what they considered the most important thing for children to prepare them for life, 62 percent chose from a list the alternative "To think for themselves." However, only 5 percent gave an answer that could be assigned to this category when no list was presented. 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, more difficult; and 41 percent, stay as it is. But when others 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 tennis to soccer, 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.

With web-based surveys, Mirta Galesic and Michael Bosnjak (2009) found that the longer the survey questionnaire the fewer people were willing to participate. Of those who did participate, "answers to questions positioned later in the questionnaire were faster, shorter, and more uniform than answers to questions positioned near the beginning."

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 11 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.

Barone, M. (1996, December 9). Why opinion polls are worthless. *U.S. News and World Report,* p. 52.

Berke, R. L. (1998, February 15). Clinton's O.K. in the polls, right? *New York Times,* Section 4, p. 1.

Cox, A. M. (2004, October 30). Twilight of the pollsters. *STATS: Twilight of the pollsters.* Retrieved from www.stats.org/stories/2004/twilight_of_the_pollsters_oct30_04.htm.

Galesic, M., & Bosnjak, M. (2009). Effects of questionnaire length on participation and indicators of response quality in a web survey. *Public Opinion Quarterly, 73*(2), 349–360. doi: 10.1093/poq/nfp031.

Institute for Public Policy and Social Research, 1997. State of the State Survey, "Attitudes Toward Crime and Criminal Justice: What You Find Depends on What You Ask," No. 97-20, Michigan State University. East Lansing, Mich. Retrieved on November 1, 2007 from http://ippsr.msu.edu/Publications/bp9720.pdf.

Madson, L. (2005). Demonstrating the importance of question wording on surveys. *Teaching of Psychology, 32,* 40–43.

Morin, R. (1994, March 27). Confusing question may have skewed survey showing doubts about Holocaust. *The Grand Rapids Press,* p. G4.

Schwartz, N. (1999). Self-reports: How the questions shape the answers. *American Psychologist, 54,* 93–105.

Statistical Association Assessment. (2001, October 1). The Worst Question Ever? Retrieved from www.stats.org/record.jsp?type=news&ID=381.

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.

1. Obtain a wide-mouthed, clear gallon jug. These can be found online or perhaps your campus food service can provide one.
2. Purchase a large quantity of small white beads and identical-sized colored beads. Perler plastic beads—used in children's craft projects—can be purchased cheaply online in lots of 1000, and they come in a variety of colors.
3. Place a large *known* quantity of beads in the jug—at least 10,000 beads. This will be the *population* and can be considered, for all practical purposes, as infinite. Since the white and colored beads are identical in size, you need only measure a known proportion of each—for example, 60 percent white (6000 beads), 40 percent green (4000 beads). Mix the beads 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 beads represent supporters of the Democratic candidate, green beads support the Republican." If there are 30 people in the class, have each person drop 50 beads randomly from a closed hand, counting the two colors.
5. Tabulate the results. Tallying 15 groups of 100 beads 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.

Mueller, J. (2005). *Instructor's manual to accompany Myers' Social Psychology* (8th ed.). New York: McGraw-Hill.

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 distribution of colors in the world's M&M'S population (more than 400 million are produced each day)?

Buy a large bag of fun-size packs and allow each student to choose an "intact random sample" from the population of samples. Begin by identifying the possible colors and asking students to estimate from their own experience what might be the actual distribution.

Produce the following data sheet (handwritten on the board, hard copy for students, or as a spreadsheet displayed on the classroom computer):

	Blue	Brown	Green	Orange	Red	Yellow
Observed frequency						
Predicted %						

Students should open their bags, count each color, and make a simple graph of the distribution. Sample sizes, although approximately 24, will vary. Have them convert their raw data into percentages to form a hypothesis 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 figures. At the end, compare your fit of the classroom's data with the actual Mars distribution (if you like, use the chi-square test). In 2011, the distribution was blue, 24%; orange, 20%; green, 16%; yellow, 14%; red, 13%; and brown, 13%

Obviously, you can also use this demonstration to illustrate and review the various measures of central tendency and variation. Both you and your students will discover whether they truly understand the concepts of sampling and of drawing inferences from samples.

You may also want to discuss attrition if you discover that some of the class data points have been eaten!

M&M'S Then, NOW & In Between – Part 2. (2011, May 26). Write The Company. Retrieved from writethecompany.com/mms-then-now-in-between-part-2.

Smith, R. A. (1999). A tasty sample(r). Teaching about sampling using M&M's. In L. T. Benjamin, B. F. Nodine, R. M. Ernst, & C. B. Broeker (Eds.), Activities handbook for the teaching of psychology (pp. 66–68). Washington, DC: American Psychological Association.

Lecture/Discussion Topic: Predicting 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 a national election. In this example, the researcher used U.S. presidential elections. However, the point can also be made with any major election—for prime minister or any other national leader.

To predict the outcome of a U.S. presidential election, one needs, of course, a representative sample of all adult Americans *who will actually vote* in the election, not of all adult Americans. In 2012, about 57.5 percent of eligible voters voted. These numbers vary considerably from state to state and party to party (Delrio, 2012). Furthermore, one cannot just take the voter's word that he or she will vote. About one-third of those who say they will vote never show up. Voting, like charitable giving, is socially desirable, something people tend to overstate. Ask students how they would separate the likely voters from the unlikely voters. Some pollsters ask questions like "Are you following the news?" or "Did you vote in the last election?" (Cox, 2004).

Another complication in obtaining a representative sample of voters is that all major polling organizations use the phone to contact respondents. This means those who don't have a phone are automatically eliminated. For years, polling organizations only called landlines; starting in January 2008, the Gallup organization has included cell-phone numbers in all of their national telephone surveys. Challenge students to consider which demographic groups would be more likely to be excluded from an opportunity to participate in a survey if cell-phone numbers were not included. Gallup has found that younger people, racial and ethnic minorities, and those with no permanent home tend to have only a cell phone ("Does Gallup Call Cell Phones?," n.d.). Ask students how many phone numbers they have. The more phone numbers they have, the greater the likelihood they will be given the opportunity to participate in a survey. Is there a difference between those who have one phone number and those who have two or more?

Another 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 getting 30 percent of his sample from people who were called during the day. Ask students to consider why time of day matters. Zogby's samples may have contained a disproportionate number of retirees and stay-at-home parents (Morin & Deane, 2004).

Ask students to raise their hands if they have ever turned down participating in a poll. In the United States, 60 to 80 percent of those who are asked to participate refuse. How are the people who say yes different from those who say no? Are those who agree to participate more friendly? Perhaps they are less pressed for time. Unfortunately, there is no way to know because we would have to survey those who choose not to participate in surveys (Cox, 2004).

Even though collecting survey data has its challenges, Nate Silver declared that Barack Obama had a 90.9 percent chance of winning the 2012 U.S. presidential election while others were declaring the race too close to call. In fact, Silver successfully predicted the presidential results in all 50 states. This wasn't a fluke. In 2008, he was almost as accurate, calling the presidential race correctly in 49 of 50 states and in all 35 Senate contests. What is Silver's secret? He uses a formula "based on a combination of electoral history, demographics and polling" (Shergold, 2012).

As a bonus, watch Nate Silver's 9-minute TED talk, "Does racism affect how you vote?": www.ted.com/talks/nate_silver_on_race_and_politics.html

Cox, A.M. (2004, October 30). Twilight Of The Pollsters. STATS: Twilight of the pollsters. Retrieved from www.stats.org/stories/2004/twilight_of_the_pollsters_oct30_04.htm.

Delrio, M. (2012, November 12). 93 million eligible voters did not vote in 2012.Examiner.com. Retrieved from http://www.examiner.com/article/93-million-eligible-voters-did-not-vote-2012

Gallup.com (n.d.) *Does Gallup call cell phones?* Retrieved November 22, 2013, from www.gallup.com/poll/110383/Does-Gallup-call-cell-phones.aspx.

Morin, R., & Deane, C. (2004, January 26). A snowy graveyard for pols and polls. *The Washington Post,* p. C.01.

Shergold, A. (2012, November 8). The man you can count on: The poker-playing numbers expert who predicted Presidential election outcomes with incredible accuracy. Mail Online. Retrieved from http://www.dailymail.co.uk/news/article-2229790/US-Election-2012-Statistician-Nate-Silver-correctly-predicts-50-states.html

Correlation

PsychSim 6: 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?" Use scores from the previous term (anonymously, of course) to create a data file. 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. 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 term is to examine the correlations between scores on two or more tests taken by your present class.)

> Wallace, J. (1987). A demonstration of correlation and prediction. In V. P. Makosky, L. G. Whittemore, & A. M. Rogers (Eds.), *Activities handbook for the teaching of psychology,* Vol. 2 (p. 207). Washington, DC: American Psychological Association.

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.

> Davis, S., & Grover, C. (1987). Is quicker always better? Test-taking time and performance. In V. P. Makosky, L. G. Whittemore, & A. M. Rogers (Eds.), *Activities handbook for the teaching of psychology,* Vol. 2 (pp. 208–209). Washington, DC: American Psychological Association.

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. 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 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.

4. 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.
5. Paulos' *Beyond Numeracy: Ruminations of a Numbers Man* provides additional delightful examples of how a common third factor may explain correlations between two variables. Ask your students if they can explain the following: Why do children with bigger feet spell better? Why, in certain counties in the southern United States, are divorce rates negatively correlated with death rates? Why do nations that have added fluoride to their water have a higher cancer rate? In each case, age may be the critical third factor. Children with bigger feet are older (and thus spell better), older couples are less likely to divorce but also more likely to die, and those nations that add fluoride are generally wealthier, more health conscious, and thus their citizens live long enough to develop cancer (largely a disease of old age).

Paulos, J. A. (1991). *Beyond numeracy: Ruminations of a numbers man*. New York: Knopf.

Paulos, J. A. (1989). *Innumeracy: Mathematical illiteracy and its consequences.* New York: Random House.

Salkind, N. J. (2004). *Statistics for people who think they hate statistics* (2nd ed.). Thousand Oaks, CA: Sage Publications.

Tierney, J. (1987, September/October). Good news! Better health linked to sin, sloth. *Hippocrates,* pp. 30–35.

Classroom Exercise: Positive and Negative Correlations

Correlations let us predict. If we know the correlation between two variables, we can predict, given one variable, where the other one will fall. The higher the correlation, the better our prediction.

Provide students with the seven correlations in Handout 8. Their task is to identify whether each correlation is positive, negative, or no correlation. This activity is a good candidate for small groups as much discussion will ensue. You may also choose to put these correlations on a series of presentation slides. Students can note their choice by your preferred method: student response system ("clickers"), students' own web-enabled devices via services like Socrative or PollEverywhere, or ABCD cards (a set of cards with the letters A, B, C, and D, each a different color so it is easy for the instructor and students to see the dominant answer).

Students will sometimes get caught up debating whether the relationship between a particular pair of variables is true. If they conclude that a correlation isn't true, they will mark it as "no correlation." Remind students that a correlation describes observed data, not our evaluation of the data.

It helps to tell students that in approaching this task, they are to ask themselves two questions about each example.

1. What are the two variables being described?
2. Which direction is each variable moving? If the variables are moving in the same direction, it's a positive correlation. If the variables are moving in opposite directions, it's a negative correlation. If the variables are not moving together, there is no correlation.

Here are the correlations for your reference.

1. People who smile more intensely as children (as measured by number of crow's feet around the eyes in photos) are more likely to remain married through middle age (Lite, 2009). [POSITIVE]
2. People who sleep less than 5 hours a night on average are more likely to have calcium deposits in their arteries (Rabin, 2008). [POSITIVE]
3. People who multitask the most are the worst at it; this includes memory, ability to switch from one task to another and being able to focus on a task ("Multitaskers, Pay Attention — If You Can," 2009). [NEGATIVE]
4. People who are taller are more likely to have higher incomes. This is especially true in sales (Judge & Cable, 2004). [POSITIVE]

5. People who are more physically active at 60, like doing housework and gardening, are less likely to have a heart attack or stroke in the next 12 years (Ekblom-Bak, Ekblom, Vikström, De Faire, & Hellénius, 2013). [NEGATIVE]
6. The more soda children consume (zero to four sodas per day), the more aggressive the children are (Suglia, 2013). [POSITIVE]
7. Young men (18-22) who watch a lot of television (more than 20 hours per week) have a lower sperm count than men who don't (Gaskins et al., 2013). [NEGATIVE]

Classroom Exercise: Displaying Scatterplots

Philip Stark (2013) has created a wonderful web-based program (URL in the reference below) that displays scatterpots. Enter a correlation and the number of data points that you want, and a scatterplot will be created. Ask students what the scatterplot would look like for a 1.0 correlation, for a +0.9 correlation, for a 0.0 correlation, for a –1.0 correlation. Add data points by clicking on the scatterplot. Ask students what impact the addition of those points will have on the correlation.

> Stark, P. B. (2013, January 21). *SticiGui*. Retrieved November 23, 2013, from http://stat-www.berkeley.edu/~stark/Java/Html/Correlation.htm.

Television Show: Homer Simpson and Illusory Correlation

A very brief clip from the episode "Much Apu About Nothing" of *The Simpsons,* Season 7 (available on DVD), provides a humorous introduction to illusory correlation. In the program, Springfield invests millions of dollars in a highly sophisticated "Bear Patrol" after a single bear was spotted the week before.

Lisa and Homer have a memorable exchange in which Homer notes how well the patrol is working: "Not a bear in sight." Lisa challenges Homer's conclusion. She states, "By your logic, I could claim that this rock keeps tigers away." Homer asks how it works and Lisa replies, "I don't see any tigers around, do you?" Homer pauses and then pleads, "Lisa, I want to buy your rock."

Asking students what's wrong with Homer's reasoning can lead to a fruitful discussion of what data we need to determine whether two variables are actually correlated. For example, with the rock present, on how many days do tigers appear and on how many days do they not appear? We also need to know what happens when the rock is removed. Again, on how many days do tigers appear and on how many days do they not appear?

Classroom Exercise: Illusory Correlation

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 psychics such as Terry and Linda Jamison (The Psychic Twins) 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.

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 our 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 it rains more during rush hour.

In *The Power of Logical Thinking,* Marilyn vos Savant provides the wonderful example of "feline high-rise syndrome" that illustrates how illusory correlation results when we fail to consider all relevant information. In its "Science Times" supplement, the *New York Times* once reported evidence for cats' exceptional ability to survive falls from high-rise buildings. It noted that from June 4 through November 4, 1984, 132 such victims were admitted to the Animal Medical Center. The falls ranged from 2 to 32 stories. Most of the cats landed on concrete and most survived (only 8 of the 132 died from their injuries). The *Times* went on to explain how experts believed that cats are able to survive such falls because of the laws of physics, superior balance, and even the so-called flying squirrel tactic. Failing to consider contrary evidence, vos Savant published the story in her well-known column. She admits a need to rethink the claim after letters from more than a few readers indicated that their falling cats had died, and, of course, were not brought to any medical center nor were their deaths reported.

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 previously 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.

Gilovich, T. (1997, March/April). Some systematic biases of everyday judgment. *The Skeptical Inquirer,* 31–35.

Gilovich, T. (1991). *How we know what isn't so*. New York: Free Press.

vos Savant, M. (1997). *The power of logical thinking.* New York: St. Martin's Press.

Classroom Exercise: Illusory Correlation Demonstration

Jay Jackson (2000) has created an illusory correlation demonstration based on the classic 1976 study by David Hamilton and Robert Gifford. When two rare events occur together, they appear more related than they are. In this demonstration, you show students 39 individual presentation slides describing individuals who are either from Group A (majority members) or Group B (minority members) and who have either a desirable characteristic (for example, "helped a lost child in the supermarket yesterday") or an undesirable characteristic (for example, "kicked a dog for no good reason"). Group B has fewer members (13) than Group A (26). Groups A and B have the same percentage of members with desirable/undesirable characteristics, but there is a smaller number of people with undesirable traits in both groups; the ratio is 9 good characteristics to 4 bad characteristics. Thus, the fewer people in Group B combined with a lesser number of undesirable characteristics will cause participants to see a stronger connection between minority faces and undesirable traits than actually exists. After presenting the slides describing the individuals, ask students to rate each group on a 1–7 Likert scale for "being generally popular, lazy, unhappy, intelligent, honest, irresponsible, helpful, or unpopular." Next, ask students to estimate how many desirable/undesirable behaviors were described for both Groups A and B. While student volunteers calculate the means, lead the remaining students in a discussion of what results they expect and why. In Jackson's experiment, the smaller group was perceived to have more undesirable characteristics than the larger group.

After the results are revealed, discuss the "real-world" implications of these results on minority groups, such as ethnic minorities, people who are mentally ill, religious groups, and so on. Some of your more astute students may wonder if the results are due to an overall negative feeling toward minority groups in general. Jackson points out that Hamilton and Gifford wondered the same thing. The second study published in that same 1976 article switched the ratio for desirable/undesirable characteristics from 9:4 to 4:9. As predicted, the smaller group was now perceived to be better than the larger group.

You can download a PowerPoint presentation of this demonstration created by Marcel Yoder from CROW: Course Resources on the Web: jfmueller.faculty.noctrl.edu/crow/IllusoryCorrelationDemonstration.ppt.

Hamilton, D. L., & Gifford, R. K. (1976). Illusory correlation in interpersonal perception: A cognitive basis of stereo-typic judgments. *Journal of Experimental Social Psychology, 12*(4), 392-407. doi: 10.1016/S0022-1031(76)80006-6.

Jackson, J. W. (2000). Faculty forum: Demonstrating the concept of illusory correlation.*Teaching of Psychology, 27*(4), 273-–276.

Classroom Exercise: The Power of Disconfirming Evidence: Do Dreams Predict the Future?

Many people believe that their dreams predict the future. When asked why they hold such beliefs, people often cite experiences they've had in their waking lives that were preceded by a dream about those same experiences. On the one hand, personal experience and anecdotal evidence can help illustrate a point or serve as meaningful examples of a concept in action. However, as David Myers later points out in discussing

thinking, the problem with relying on personal experiences and anecdotes is that we humans have a robust tendency to seek out evidence that confirms our beliefs and schemas, and an equally robust tendency not to notice disconfirming evidence. These tendencies lend to the challenge of scientific thinking. The nature of hypothesis testing is to examine confirmatory evidence together with disconfirming evidence (which is why, for example, experiments contrast experimental groups with control groups).

A simple yet powerful way to test the idea that dreams predict the future is to have students design an experiment in which they collect data about the frequency of specific dream content and compare it with specific real-life events. First, have students select a specific dream content that interests them. However, it is important that students select content that can easily be defined operationally and that is relatively common (you might want to stay away from controversial or "taboo" dream content). Next, students should decide what the "real-life" events are that they believe may be predicted by their dreams and prepare clear and detailed operational definitions of these, too. (It isn't necessary for students to pick entire events to watch for. They can also choose to watch for activities, objects, events, experiences, or anything else that interests them.) Finally, students will need to decide how much time they want to allow between a dream and the real-world event(s) they will be watching for. Although it might be simplest to use an interval of 24 hours, it might be more interesting to your students to conduct their observations over 48 hours or longer. The time interval you allow will depend upon the number of days across which you wish to run this activity.

When students have agreed on a target dream content and a target real-world event, and the time frame for their observations, they're ready to collect data. You may instruct each student to collect data about him/herself, or have students work in pairs or small groups. Using the frequency table in Handout 9a, students should record data separately for each sleep episode they experience. (Each time they fall asleep and then wake up is a sleep episode, whether it is a full night's sleep, a 10-minute "power nap," or something in between.) They are to record very simply whether the target dream content occurs during a dream in a given sleep episode and whether the target real-life event occurs during the specified interval after the dream. Dream data should be recorded as soon as possible after the dreamer awakens, and real-life event data should be recorded as soon as possible after the agreed-upon interval lapses.

To further student understanding of experimental design, you might also come up with control conditions: select a different kind of dream content and a different real-life event and have students keep track of their frequencies beside their target dream contents and real-life events. You may wish to modify the handout to suit your own purposes.

When the observation interval has finished, distribute Handout 9b and have students summarize their findings in the frequency table. Have students submit their summary data to you before class, so you can create a summary frequency table for the observed frequencies across the entire class and conduct a chi-square analysis of the data.

In class, before you present the findings from the experiment, discuss the confirmation bias and its meaningfulness for the experiment. In everyday life, the confirmation bias would cause people to notice the number of times they dream about certain contents followed by the target events in real life (the upper left-hand quadrant of the summary table). If dreams truly do predict real-life events, what kinds of frequencies would we expect to observe in this quadrant? How would this compare with the expected frequencies in the other quadrants? (You can build suspense among the students by asking for their answers to these questions before you enter the data from their own observations.)

In the scientific method, we must weigh the observations in one condition against what we observe in the other conditions. This allows us to examine disconfirming evidence and to consider explanations other than the one being tested in the hypothesis. When you compare the frequency in the upper-level quandrant of the class data with the observed frequencies in the other three quadrants, students will see that the picture is much more complicated than their simplistic confirmation bias would lead them to believe.

Lecture/Discussion Topic: Misinterpreting Correlations

Keith Stanovich has identified two major classes of ambiguity in correlational research: the "directionality 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 corrective therapies. 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 direc-

tion. 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.

   Stanovich, K. (2007). *How to think straight about psychology* (8th ed.). Boston: Allyn & Bacon.

Classroom Exercise/Student Project: Correlation Does Not Imply Causation

Tim Robicheaux (n.d.) has developed a set of exercises to help students identify the third variable and directionality problems in correlations reported in the media (Handout 10). A few examples have been modified from the original with his permission. All of the examples come from actual news stories. The references to the stories are listed here for your convenience.

Third Variable Problem:

1. "Diet of fish 'can prevent' teen violence"
   Do the data support the headline? No.
   What are some third variable explanations? The social support given or the skills learned in the program may have helped the children avoid criminal behavior.
   How could you reword the headline? Early program is associated with less contact with criminal justice system as adults

2. "Higher beer prices 'cut gonorrhea rates'"
   Do the data support the headline? No.
   What are some third variable explanations? Greater access to sex education may have happened during the same time period.
   How could you reword the headline? Relationship between beer tax and gonorrhea rates reported

3. "Luckiest people 'born in summer'"
   Do the data support the headline? No.
   What are some third variable explanations? If the survey was done in late summer, those who just had birthdays may report feeling luckier after having recently received social support in the form of happy birthday wishes.
   How could you reword the headline? More people born in summer report feeling lucky

Directionality Problem:

How could you reverse the headline? Give a rational explanation for the causality you created in your reversed headline.

1. *Social isolation may have a negative effect on intellectual abilities*
   Intellectual abilities may influence social isolation
   Explanation: While being socially isolated may cause one to have decreased intellectual abilities, it may also be true that those with lower intellectual abilities may have fewer friends thus contributing to social isolation.

2. *Keeping a food diary doubles weight loss*
   A strong desire to lose weight may cause people to keep a food diary
   Explanation: While the act of paying closer attention to what one is eating by, say, keeping a food diary may cause people to eat better and therefore lose weight, it may also be true that those are the most motivated to change their diet may also be the ones to be most likely to keep a food diary.

3. *Some cancers spur divorce risk*
   Stressful relationships may cause some cancers
   Explanation: While having cancer may put a strain on relationships leading to their ultimate collapse, it may also be true that being in a stressful relationship may take a toll on the body increasing the risk of certain cancers.

The references to the stories are listed here for your convenience.

Higher beer prices 'cut gonorrhea rates'. (2000, April 28). BBC News. Retrieved from news.bbc.co.uk/2/hi/health/729298.stm.

Hinsliff, G. (2003, September 14). Diet of fish 'can prevent' teen violence. The Observer. Retrieved from www.theguardian.com/politics/2003/sep/14/science.health.

Keeping a food diary doubles weight loss, study suggests. (2008, July 8). *ScienceDaily.* Retrieved from www.sciencedaily.com/releases/2008/07/080708080738.htm.

Luckiest people 'born in summer'. (2004, April 14). *BBC News.* Retrieved from http://news.bbc.co.uk/2/hi/health/3622817.stm.

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Some cancers spur divorce risk: Study. (n.d.). *The National Post.* Retrieved from http://www.nationalpost.com/opinion/columnists/story.html?id=bde2acde-3e43-48ec-8f7d-69960620e322.

Experimentation

Classroom Exercise: Introducing the Experiment

William Balch (2006) provides a simple classroom exercise for introducing basic experimental design, including independent and dependent variables and the need for control. The demonstration replicates the well-established finding that pleasant stimuli are more likely to be recalled than unpleasant stimuli.

The classroom presentation of 12 pleasant versus 12 unpleasant words represents the independent variable; recall of the words is the dependent variable. The 12 pleasant words (having a prior mean rating of 5.5 on a 7-point scale from 1 = extremely unpleasant to 7 = extremely pleasant in M. P. Toglia and W. F. Battig's 1978 *Handbook of Semantic Word Norms)* are *hope, style, interest, cure, beauty, trust, liberty, comfort, benefit, praise, travel,* and *wisdom.* The 12 unpleasant words (with a comparable mean rating of 2.6) are *fool, quarrel, hunger, loss, theft, decay, trouble, insult, panic, grudge, fraud,* and *rumble.* To reduce a possible primacy effect, two neutral words, *area* and *meeting,* appear at the beginning of the word list.

Before covering research methodology in class, ask students if they are willing to rate the pleasantness-unpleasantness of a list of words that you will present to them. You can write the scale on the chalkboard (from 1= extremely unpleasant to 7 = extremely pleasant) and have them number from 1 to 50 on a blank sheet of paper. Alternatively, prepare a series of 50 rating scales (with the same range from 1 to 7) to distribute to class. Beginning with the two buffer words, *area* and *meeting*, present two consecutive random orders of the 24 experimental words at six-second intervals. (For each word, students are to rate it from 1 to 7.) Thus, students will be rating a total of 50 words (48 from the two lists and the two buffer words the first time the first list is read.

To counteract a recency effect, have students put aside their ratings while you introduce the basics of experimental design. After a few minutes, ask students to take out another sheet of paper and recall as many words as they can. Re-read the list of 12 pleasant and 12 unpleasant words and have students score their own sheets. Finally, with a show of hands, ask how many students recalled more pleasant than unpleasant words, more unpleasant than pleasant words, or the same number of each word type. Record the results where students can see them.

Describe to your class the basic experimental hypothesis: People recall more pleasant than unpleasant words. Ask your class whether the results support the hypothesis. (If you prefer, you can collect and score students' recall sheets between classes.) In addition to identifying the independent and dependent variables, you can describe the importance of holding constant ("controlling") other variables. For example, the two lists of words are comparable on four other prior rating scales, that is, concreteness, mean = 3.5; imagery, mean = 4.3; meaningfulness, mean = 4.8; familiarity, mean = 6.1. Finally, you might also take the opportunity to introduce the importance of debriefing and research ethics. Sometimes, researchers withhold information from participants (you did not tell them about the memory task in advance) and so are obligated to provide full information at the conclusion of the study. Although informed consent is not generally required for classroom demonstrations, investigators would have volunteers sign a consent form before they participated.

A newer set of word norms has been created by Peter Lang and his colleagues at the Center for the Study of Attention and Emotion (CSEA) at the University of Florida. Identified as the affective norms for English words (ANEW), this resource provides a set of normative emotional ratings for a large number of words in the English language including those for pleasure, arousal, and dominance. You can request a copy

of the ANEW by going to the CSEA website and downloading a request form here: csea.phhp.ufl.edu/media/anewmessage.html

You and your students may find it interesting to compare the ratings of Balch's words provided in this later norm set. Discuss your class findings in light of the similarity and differences in the norms. You may want to guide your class in designing a replication and extension of Balch's original findings based on the hypotheses that your students generate.

Balch, W. R. (2006). Introducing psychology students to research methodology: A word-pleasantness experiment. *Teaching of Psychology, 33,* 132–134.

Bradley, M. M., & Lang, P. J. (1999). Affective norms for English words (ANEW): Stimuli, instruction manual and affective ratings. Technical report C-1, Gainesville, FL. The Center for Research in Psychophysiology, University of Florida.

Student Project/Classroom Exercise: The Placebo Effect

Challenge your students to assess whether the apparent effectiveness of therapeutic touch reflects the placebo effect. 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 their bodies. Then the student experimenters should tell their volunteers to keep their eyes open, and, flipping a coin, the experimenters should 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.

Amber Lange uses students' responses to decaf coffee to demonstrate the placebo effect. Bring a carafe of decaf to class (along with cups and creamer) and invite volunteers to drink "coffee." Toward the end of class, invite the coffee drinkers to indicate whether the coffee has helped them stay alert. Some of the students are likely to indicate that it has. Lange reports that even after she reports the coffee was not caffeinated, some students insist that it had an effect.

Lange, A. (2005, November 13). Most effective Psy101 methods. Message posted to PSYCHTEACHER@list.kennesaw.edu.

Classroom Exercise: Random Assignment

Craig Enders and his colleagues provide a helpful demonstration of random assignment. The exercise uses standard playing cards as experimental "participants." As is true of human research participants, the cards have unique characteristics or background variables that may affect performance on a dependent variable. These characteristics include color (red or black), suit (spade, club, diamond, or heart), whether it is a face or number card, and the magnitude of the numeric value.

The aim of the demonstration is to randomly assign the "participants" to one of two treatment conditions so that the background variables are equally distributed between the two groups. Although each student can conduct the exercise, using small groups of two or three will expedite the demonstration. Give each small group a deck of playing cards and have them assign each card to one of the two treatment conditions with a coin toss or by first thoroughly shuffling the decks and alternating draws between the two treatment conditions. After the students have formed the two treatment conditions, they record the number of times each background variable occurs in each condition. Have each group then report its findings to the full class.

The authors indicate that some groups will have nearly flawless randomization resulting in equal representation of the various background characteristics between the two groups of cards. Other groups will have less equivalence. Take this opportunity to note that equivalence is probabilistic and that it is possible to obtain disparate groups by chance. Sample size is one of the influences on the randomization process. Varying the total number of cards (from a half deck to three decks) will demonstrate this. The demonstration effectively makes an abstract concept more concrete.

Enders, C. K., Laurenceau, J. P., & Stuetzle, R. (2006). Teaching random assignment: A classroom demonstration using a deck of playing cards. *Teaching of Psychology, 33,* 239–242.

Classroom Exercise: Main Effects and Interactions or "It All Depends"

In a class activity that illustrates and extends the text description of the experiment, Hank Rothgerber and Eric Anthony Day show the importance of interactions

that occur when the effect of one independent variable depends on the level of a second independent variable.

The activity uses a 2 (typicality of the jelly bean: cherry versus buttered popcorn or cappuccino) x 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 or cappuccino 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 women be given cherry-flavored jelly beans and all men 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)

	Prior Information		Main Effect
Flavor	No	Yes	(flavor)
Cherry	4.00	4.20	4.10
Buttered popcorn	2.00	3.80	2.90
Main effect (information)	3.00	4.00	

Table from *Activities Handbook for the Teaching of Psychology, Volume 4,* edited by L. T. Benjamin, B. F. Nodine, R. M. Ernst, & C. B. Broeker. Copyright 1999 by the American Psychological Association, p. 71.

Rothgerber, H., & Day, E. A. (1999). Using jelly beans to teach some concepts in research methodology. In L. T. Benjamin, B. F. Nodine, R. M. Ernst, & C. B. Broeker (Eds.), *Handbook for the teaching of psychology* (Vol. 4). Washington, DC: American Psychological Association.

Student Project/Classroom Exercise: Identifying Variables and Groups and Correlational Versus Experimental Studies

Throughout his various texts, David Myers demonstrates concepts by citing research results, for example, Jamin Halberstadt's (1995) finding that "sad rather than happy music can predispose people to perceive a sad meaning in spoken homophonic words." Handout 11 includes a sampling of these citations. Distribute the handout and ask students to identify the independent variables and dependent variables, as well as the experimental and control groups. This can be done as an in-class, small-group activity or as assigned homework.

Following are the answers to Handout 11, identified by sample number.

1. Experimental group: Nasal squirt of oxytocin
   Control group: Placebo
   Independent variable: Presence/absence of oxytocin
   Dependent variable: Willingness to trust strangers with money
2. Experimental group: Ddopamine-increasing drug
   Control group: Sugar pill
   Independent variable: Presence/absence of dopamine-increasing drug
   Dependent variable: Desirability of different vacation destinations
3. Experimental group: Sad music
   Control group: Happy music
   Independent variable: Type of music
   Dependent variable: Perceiving a sad meaning in spoken homophonic words
4. Experimental group: Fatigued by prior exercise
   Control group: No fatigue
   Independent variable: Amount of fatigue
   Dependent variable: How far away walking destinations look
5. Experimental group: McDonald's bag
   Control group: Plain white bag
   Independent variable: Type of bag
   Dependent variable: How good french fries taste
6. Experimental group: Hungry
   Control group: Not hungry
   Independent variable: Amount of hunger
   Dependent variable: Likeliness of donating to charity
7. Experimental group: Watching sexually violent movies
   Control group: Watching non-sexually violent movies
   Independent variable: Type of movie
   Dependent variable: How bothered one is by rapes and slashings
8. Experimental group: Removed hippocampus
   Control group: Intact hippocampus
   Independent variable: Presence/absence of hippocampus
   Dependent variable: Ability to locate unmarked food caches
9. Experimental group: Red pen
   Control group: Black pen
   Independent variable: Color of pen
   Dependent variable: Number of errors spotted and grades given
10. Experimental group: Red shirt
    Control group: Green shirt
    Independent variable: Color of shirt
    Dependent variable: How close participants sat to woman and how intimate the questions were that they asked

Myers, D. G. (2013) *Psychology,* 10/e. New York: Worth.

Lecture/Discussion Topic: Field and Laboratory Experiments

In an effort to overcome the artificiality of the laboratory environment, some researchers conduct field experiments. For example, Donald Dutton and Arthur Aron (1974) used the field experiment to test the hypothesis that passionate love sometimes involves a state of physical arousal that is misattributed to a romantic stimulus.

As noted in the text, the researchers conducted their study on two bridges that cross British Columbia's rocky Capilano River. One was a swaying suspension bridge, 230 feet above the rocks. The other was low and fixed. Men coming off each bridge met an attractive young female accomplice who sought their help in filling out a short questionnaire. She offered her phone number in case they wanted to learn more about her project. The results indicated that those who crossed the high bridge (and left the structure with their hearts pounding) were significantly more likely to accept the number and to later call the woman than were those men who crossed the low, solid bridge. To be aroused and to associate that arousal with a desirable person is to experience romantic attraction.

What the field experiment gains in realism it may lose in control. Dutton and Aron wondered if the men crossing the two bridges differed in respects that might explain the findings. Perhaps the men choosing the suspension bridge were more adventurous and thus more likely to call the female accomplice. To check this possibility, they recruited men for a laboratory experiment investigating the impact of electric shock on learning. The men were *randomly assigned* to conditions in which they believed they would receive either a strong shock or a mild shock. Presumably, those told they would receive a strong shock would experience more physical arousal. The study included an attractive woman who appeared to be another participant but was actually an experimental confederate. The results indicated that the men in the strong shock condition were more attracted to the woman than were those in the weak shock condition. Thus, the laboratory experiment supported the findings of the field experiment.

In a more recent field study, Whitney Morgan and colleagues (2013) wondered if pregnant women applying for jobs are more likely to be treated with hostility than women who are not pregnant. Previous laboratory research found "four potential stereotypes driving hostile attitudes and discriminatory behavior toward pregnant women: incompetence, lack of commitment,

inflexibility, and need for accommodation." In describing this study to students, ask for operational definitions of hostility. If students were conducting this study, how would they measure hostility? Here is how the researchers measured it. "Using 7-point Likert-type scales (0 = Not at All; 6 = Very Much), applicants rated the extent to which sales personnel (a) attempted to prematurely end the conversation, (b) pursed their lips, (c) exhibited hostility, (d) were rude, (e) furrowed their eyebrows, and (f) were awkward."

In this study, the researchers arranged for a few women who were working as confederates to apply for a job in a retail establishment. There were six conditions, each condition with its own script:

> Nonpregnant: The women inquired about a job exactly as they were, not pregnant.
>
> In the remaining conditions, the women wore a pregnancy prosthesis.
>
> Pregnant control. The women followed the same script as the nonpregnant condition.
>
> Pregnant displaying competence. The women, while inquiring, noted prior experience in retail and a college degree.
>
> Pregnant displaying commitment. The women, while inquiring, emphasized their commitment to their work.
>
> Pregnant displaying flexibility. The women, while inquiring, emphasized their work availability.
>
> Pregnant not needing accommodation. The women, while inquiring, said that they would need only two weeks off.

The researchers also arranged for other people to observe the interaction and to make the same evaluation as the female applicants. The interaction was recorded with an audio recording device. People who were blind to the study's hypothesis were asked to listen to the recordings, and make their own evaluations, using just three of the scales: attempted to prematurely end the conversation, exhibited hostility, and was rude.

The correlations between the types of raters (the women themselves, the observers, and the people listening to the recordings) were all statistically significant.

The pregnant control was most likely to be told that there were no job openings (27 percent). In comparison, only 15 percent of the nonpregnant controls were told this. The pregnancy conditions that were designed to counter a stereotype fared the same or better than the nonpregnant control. The additional information helped.

What about hostility? Interestingly, the people who were just listening to the recordings and blind to conditions perceived more hostility than the job applicant or the observer—in all of the conditions. Unsurprisingly, the pregnant control experienced the most hostility.

Dutton, D. G., & Aron, A. P. (1974). Some evidence for heightened sexual attraction under conditions of high anxiety. *Journal of Personality and Social Psychology, 30,* 510–517.

Morgan, W. B., Walker, S. S., Hebl, M. R., & King, E. B. (2013). A field experiment: Reducing interpersonal discrimination toward pregnant job applicants. *Journal of Applied Psychology, 98*(5), 799-–809.

Classroom Exercise: Psychological Research Methods

Earlier in this unit, we described an exercise developed by Jamie J. Peterson and Arturo Sesma, Jr. (2013) to help students develop scientific literacy in the context of psychological science. As an extension of that activity, they created this activity to help students understand psychological research methods.

Begin by reviewing with the students the various research methods used by psychologists: case study, naturalistic observation, survey, experiment, archive examination, for example. You may want to augment your lecture with a PowerPoint presentation (slides can be downloaded from teachpsych.org/Resources/Documents/otrp/resources/peterson/Presentations%20without%20Answers.Final.pptx). Alternatively, you can skip the review and jump right into the analysis of the media article introduced earlier ("Parents can play active role in making teens interested in math and science"; see p. 10).

After students have read the article (either earlier or at this time in class—the article is not long), ask them to identify the research method used, then explain how they know. Then, discuss with students how the researchers could have used a different research method. Be specific about each of the methods. For example, this study used the experimental method. How would they have obtained these results with a survey? Naturalistic observation?

To help students practice what they have learned, have them try the different methods in three different group activities. First, give students the following hypothesis: Students who study with friends learn better than students who study by themselves.

Activity One: Break the class into three groups and assign a different research method to each group (for example, Group 1 will use naturalistic observation, Group 2 will use an experiment, and Group 3 will use a survey). Then distribute Handouts 12a–c to the appropriate groups. The handouts include questions that will guide students in designing their study.

Activity Two: Form new groups composed of members from each of the old groups. Students should discuss each of their proposed methods and agree on the best method for testing the hypothesis.

Activity Three: Bring the students back as one large class. Ask each group to share with the entire class its proposed method.

The instructor should model how to share the design by sharing a method for testing the hypothesis using

archival research. Lead a discussion: Ask students the strengths and weaknesses of observational studies, experiments, surveys, and archival studies.

ANI. Parents can play active role in making teens interested in math and science. (2012, July 12). Retrieved from http://in.news.yahoo.com/parents-play-active-role-making-teens-interested-math-050712211.html

Peterson, J. J., & Sesma, A., Jr. (2013). Scientific literacy in a psychology curriculum module. Society for the Teaching of Psychology. Retrieved from http://teachpsych.org/otrp/resources/index.php.

Ethics and Personal Values in Psychology

Classroom Exercise: Animal Rights

Handout 13, Ruben Bolling's "Tom the Dancing Bug," provides a wonderful introduction to the ethics of experimenting on animals. It makes the point that we value animals according to their perceived similarity to us. You can distribute it as it appears, or, before copying, you can delete (cover) 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 14, 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. Videos and computer simulations are, they argue, adequate substitutes.

Herzog, H. A. (1990). Discussing animal rights and animal research in the classroom. *Teaching of Psychology*, *17,* 90–94.

Lecture/Discussion Topic: APA Guidelines for Ethical Conduct in the Care and Use of Nonhuman Animals in Research

While the APA Ethical Principles of Psychologists and Code of Conduct (2010) discusses the care and use of

nonhuman animals, the APA wanted to provide specific guidelines to psychologists who use nonhuman animals in their teaching and research. The guidelines, last reviewed in 2012, can be found online at the website in the reference below.

The document is divided into seven sections: Justification of the research, personnel, care and housing of laboratory animals, acquisition of laboratory animals, experimental procedures, field research, and educational use of nonhuman animals.

A brief review of what is covered in this document may make students feel more at ease with how animals are used in psychological research.

Ethical Principles of Psychologists and Code of Conduct. (2010, June 1). American Psychological Association. Retrieved from www.apa.org/ethics/code/index.aspx.

Guidelines for Ethical Conduct in the Care and Use of Animals. (2012, February 24). American Psychological Association. Retrieved from /www.apa.org/science/leadership/care/guidelines.aspx.

Lecture/Discussion Topic: Invasion of Privacy

The APA Ethical Principles of Psychologists and Code of Conduct (2010) makes clear that a researcher must obtain informed consent from research participants, except under very specific circumstances. Section 8.05, "Dispensing with Informed Consent for Research" can be found at www.apa.org/ethics/code/index.aspx?item=11.

Both the complexity and controversy surrounding research ethics can be illustrated with some specific examples. Ask your students if they think, based on Section 8.05 of the APA Code, any of the following actual studies, as reported in Leary (2012), constituted an unethical invasion of privacy. Also have them indicate the criteria they used to decide whether the study is unacceptable. The debate is likely to be lively.

- 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 offers 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 (Humpreys, 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 drugstore, and shoppers' reactions are observed (Gelfand, Hartmann, Walder, & Page, 1973).
- Researchers hide under dormitory beds and eavesdrop on 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 university campus and ask them to have sex (Clark & Hatfield, 1989).

Ethical Principles of Psychologists and Code of Conduct. (2010, June 1). American Psychological Association. www.apa.org/ethics/code/index.aspx.

The studies are all cited in Leary, M. (2012). *Introduction to behavioral research methods* (6th ed.). Boston: Pearson. They are referenced here for your convenience.

Clark, R. D., & Hatfield, E. (1989). Gender differences in receptivity to sexual offers. *Journal of Psychology and Human Sexuality, 2,* 39-–55.

Gelfand, D. M., Hartmann, D. P., Walder, P., & Page, B. (1973). Who reports shoplifters? A field-experimental study. *Journal of Personality and Social Psychology, 25*(2), 276-–285.

Henle, M. & Hubbell, M. B. (1938). "Egocentricity" in adult conversation. *Journal of Social Psychology, 9,* 227–234.

Humphreys, L. (1975). *Tearoom trade: Impersonal sex in public places.* New York: Aldine.

Ickes, W. (1982). A basic paradigm for the study of personality, roles, and social behavior. In W. Ickes & E.S. Knowles (Eds.), *Personality, roles, and social behavior* (pp. 305-–341). New York: Springer-Verlag.

Leary, M. R., Landel, J. L., & Patton, K. M. (1996). The Motivated Expression of Embarrassment Following a Self-Presentational Predicament. *Journal of Personality, 64*(3), 619-–636.

Middlemist, R. D., Knowles, E. S., & Matter, C. F. (1976). Personal space invasion in the lavatory: Suggestive evidence for arousal. *Journal of Personality and Social Psychology, 35,* 541-–546.

Zimbardo, P. G. (1969). The human choice: Individuating reason, and order versus deindividuation, impulse, and chaos. In W.J. Arnold & D. Levine (Eds.), *Nebraska symposium on motivation, 1969.* Lincoln: University of Nebraska Press.

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 men-

tion Stanley Milgram's studies of obedience, 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.

> Baumrind, D. S., & Baron, R. A. (1981, August). Deceiving human subjects: An exchange. *SASP Newsletter, 7*(4), 1–11.

Classroom Exercise: Teaching Ethics in the Introduction to Psychology Course: Research Methods

Ana Ruiz and Judith Warchal (2013) suggest this in-class activity to help students demonstrate their understanding of the APA Ethics Code.

Play the *Jeopardy!* game in class using the APA Ethics Code. Ethics may be the focus of the whole game or presented just in one column.

The game can be played:

1. prior to the discussion of the code, which requires students preparation,
2. at the end of the discussion of the code,
3. at the end of the introduction to psychology chapter, or
4. at the middle or end of the semester.

Materials needed: APA Ethics Code and game template; for game templates see

> Lord, P., Martin, M. M., & Abramson, C. I. (2007). The use of PowerPoint Shareware for making *Jeopardy!*-type games in the teaching of Psychology. *Perceptual & Motor Skills, 105,* 8–14. dx.doi.org/10.2466/PMS.105.1.8–14.

You can also use jeopardylabs.com/ to create a web-based *Jeopardy!* game.

> Ruiz, A., & Warchal, J. (2013). Activities guide: Teaching ethics in the Introduction to Psychology course. Society for the Teaching of Psychology. Retrieved from teachpsych.org/resources/Documents/otrp/resources/ruiz13.pdf.

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. This issue will be noted frequently.

For example, our preconceptions bias our observations and interpretations. This will become most apparent in the text chapters on sensation, perception, and thought. 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. 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, 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. For example, in his research on moral development, Lawrence Kohlberg observes that moral judgment unfolds through a consistent series of stages. Because 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."

> Myers, D. G. (2008). *Social psychology* (9th ed.). New York: McGraw-Hill.

Classroom Exercise; Observing Versus Interpreting

Using a brief 3-minute clip from the feature film *Baraka* (available on DVD), Patricia Connor-Greene demonstrates the difficulty we have in describing human behavior without interpreting it. Besides illustrating how readily personal values can influence psychologists' research, her exercise can be used to introduce the special challenges of naturalistic observation and our strong need to identify the "why" of behavior.

The key scene appears in Chapter 4 (Balinese "Monkey" Chant) and runs from approximately 13:20 to 15:50 minutes. The clip shows a large number of people making sounds, swaying, and waving their arms but offers no information about the reason for their activity. After presenting the clip, ask students to write an anonymous response to the question: What did you *observe,* that is, what did you see and hear?

After everyone has finished writing (about 8 minutes), ask your students to answer a second question: What is your *interpretation* of what you saw and heard, that is, *why* were they doing what they were doing?

Finally, after all have finished, ask your class to review their answers to question 1 (observation) and to underline every word or phrase that was an objective, factual description (e.g., "they waved their arms," or "men without shirts made sounds") and to circle every word or phrase that was a subjective interpretation (e.g., "a happy ritual," "the leader directed them"). Connor-Greene notes that virtually every student is likely to circle at least one interpretation and will voice surprise at how unintentionally they did so when attempting to give strictly factual descriptions.

Ask volunteers to read aloud their responses to question 2 (interpretation of the behavior) and list them on the board. Although many will perceive the behavior as some form of ceremony or ritual, the presumed purpose is likely to vary greatly. In Connor-Greene's class of advanced psychology students, for example, 26 students provided a total of 32 different explanations from a coming of age ceremony to celebration of spring or a new year. Students are likely to be surprised at the varied "whys" given to the same behavior.

Inevitably, students will want to know the real "why." You might simply explain that *Baraka* is a compilation of images from around the world, but the video materials do not include any explanation of individual scenes. Clearly, not knowing is frustrating and illustrates the human need to seek closure, particularly when facing ambiguity and uncertainty in behavior. In a sense, we are all amateur psychologists seeking answers to the "why" of human behavior.

Although the scene from *Baraka* is an excellent resource for this exercise, Connor-Greene notes a video of any unusual or unfamiliar behavior can provide an effective stimulus for this exercise.

> Connor-Greene, P. A. (2007). Observation or interpretation? Demonstrating unintentional subjectivity and interpretive variance. *Teaching of Psychology, 34,* 167–171.

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 discussion of psychology and value judgments.

Statistical Concepts and Causation

Classroom Exercise: Teaching Statistical Concepts

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. If space and time do not allow this demonstration, and if you have the technology, use a student response system (aka "clickers") or make use of students' own web-enabled devices by using a service such as Socrative or PollEverywhere.

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 texts in eBook format." 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 line 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 line 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 and scatterplot, see the reference below.

Connor, J. M. (2003). Making statistics come alive: Using space and students' bodies to illustrate statistical concepts. *Teaching of Psychology, 30,* 141–143.

Lecture/Discussion Topic: The Case for Statistical Analysis

Statistics can help us see what the unaided eye might miss. Dennis Jennings and his colleagues (1982) 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 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.

Jennings, D., Amabile, T., & Ross, L. (1982). Informal covariation assessment: Data-based versus theory based judgments. In D. Kahnemann, P. Slovic, & A. Tversky (Eds.), *Judgment under uncertainty: Heuristics and biases.* Cambridge, England: Cambridge University Press.

Student Project: Organizing and Interpreting Data

Handout 15 gives students some elementary practice in organizing and interpreting real data. Suggested by David Moore (1995), it involves the ages of American presidents at the time of their inauguration. This activity will also work with the ages of prime ministers or other

national leaders at the time they take office. 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 54.64, the mode is 51 and 54, and the median is 54.5. The range is from 42 to 69, or 27 years, and the standard deviation is 6.23.

For this activity, if you would prefer to use the ages of a selection of world leaders, you can find a current list on Wikipedia: en.wikipedia.org/wiki/List_of_current_heads_of_state_and_government. Click on each leader's name to see his or her current age.

Moore, D. S. (1995). *The basic practice of statistics.* New York: Freeman.

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 16 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. If you create a web-based form (for example, Google Forms), students can enter their data before class; this is a good solution for online courses. Or if you use a student response system ("clickers") that allow for open-ended or numeric responses, you can collect data during class, and then make the data available to your students after class as a homework assignment.

All the concepts introduced in the text can be illustrated with these data, including distributions, central tendencies, variation, and correlation, which is described earlier. 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 men and women differ in GPA and SAT scores?

PsychSim 6: 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 measures 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.

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. Two other problems are presented on Handout 17. 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. "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."

   Jepson, C., Krantz, D. H., & Nisbett, R. E. (1983). Inductive reasoning: Competence or skill? *Behavioral and Brain Sciences, 6*(3), 494. doi: 10.1017/S0140525X00017180.

Lecture/Discussion Topic: The Law of Large Numbers and the Gambler's Ruin

You can extend your discussion of more cases being better than fewer by introducing the law of large num-

bers. Including a description of the gambler's ruin reminds students of the limits of human intuition.

Jeffrey Rosenthal (2006) explains that when random events are repeated, for example, the flipping of a coin, the pattern of results gets closer and closer to the expected value (half heads, half tails). The law of large numbers guarantees, that over the long haul, averages tend to settle down to their true probabilities.

Thus if a gambling game is even very slightly to your advantage on average, and you play it long enough, you are certain to come out ahead. Similarly, if the game is even slightly to your disadvantage on average, you are certain to lose. In gambling casinos, every single game is weighted ever so slightly in the house's favor.

In roulette, for example, there are typically 38 spots: the numbers 1 to 36 (alternately, red and black) plus the spots 0 and 00 (which are green). A player places a bet on where the ball will drop on the next spin. For example, betting on red means winning $10 if the ball lands on one of the 18 red spots and losing $10 if the ball lands on a black or green spot. In short, the chances of winning are 18 out of 38. Thus the player's average winning equals $10 × 18 divided by 38 minus $10 × 20 divided by 38. This equals –$.52.6. That is, on average, the player will lose just over 52 cents by making this bet. No one actually loses 52 cents; one either wins or loses $10 each time. Since the same odds apply to the casino's thousands of customers, the law of large numbers assures a profit and the gambler's ruin.

Pose this question to your students: Suppose you start with $1000 and repeatedly make $10 bets on red. What is the probability that you will double your holdings, that is, win another $1000 before you lose the $1000 you started with? Because one has almost a 50 percent probability of winning each roulette bet, one might also expect to have almost a 50 percent probability of winning $1000 before losing $1000. But the law of large numbers tells us that the probability of winning $1000 before losing $1000 is just one chance in 37,650—a very tiny probability. Winning $1000 before losing $1000 is virtually impossible. Hence the gambler's ruin.

See a web-based simulation of the gambler's ruin created by Rosenthal: probability.ca/jeff/java/gambler.html.

Rosenthal, J. S. (2006). *Struck by lightning: The curious world of probabilities.* Washington, DC: Joseph Henry Press.

Lecture/Discussion Topic: Differences Between Groups

When discussing the concept 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. Second, 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 we switch to its brand? A corporation proudly claims that its profits have increased 150 percent over those in the previous year. Should we 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.

Statistical significance is not the same thing as practical significance, or in the case of psychotherapy and treatment, clinical significance. The research on antidepressants provides an interesting example. The studies themselves are pretty straightforward. People who are depressed either receive an antidepressant of some kind or a placebo. Depressive disorders are commonly measured using the Hamilton Rating Scale for Depression (HRSD or HAM-D); you can find a copy at serene.me.uk/tests. HRSD scores range from 0 to 52.

Blair Johnson and Irving Kirsch (2008) found in their meta-analysis of antidepressant research that research participants given antidepressants dropped an average of 9.6 points on the HRSD. This appears to be pretty amazing until you compare it with those in the placebo group, who dropped an average of 7.8 points. That means that antidepressants were responsible for a mere 1.8 points above placebo. With enough research participants a 1.8 difference may be statistically significant, but it is not clinically meaningful; it's barely a nudge on the 52-point HRSD. Johnson and Kirsch then looked at people with major depressive disorder, indicated by a score above 30 on the HRSD. People taking antidepressants ended the research trial with an average 12.8-point improvement as compared with an 8-point improvement for those taking placebos. Although that's almost a 4-point difference on the HRSD, it's a small clinically significant difference. As the authors note, however, both the antidepressant and placebo groups, who had an average starting HRSD of 30, are still pretty depressed, with scores of 17.2 and 22, respectively, for those with an average starting HRSD of 30. While it's important to understand the concept of statistical significance, we can't assume that everything is okay just because we know a study has reached that threshold.

Johnson, B. T., & Kirsch, I. (2008). Do antidepressants work? Statistical significance versus clinical bene-fits. *Significance, 5*(2), 54-58. doi: 10.1111/j.1740-9713.2008.00286

Sprinthall, R. (2003). *Basic statistical analysis* (7th ed.). Boston: Allyn & Bacon.

HANDOUT 1

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

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HANDOUT 1

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 2

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 2012 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 2010 the number of female psychiatrists in the United States was more than _____ but less than _____ .

5. I feel 98 percent certain that in 2014 the number of operating nuclear plants in the world was more than _____ but less than _____ .

Sources for data: *The World Almanac and Book of Facts.* Copyright © 2014 World Almanac Education Group, Inc.; *Clinical Psychiatry News* by Franki, R. 3/5/12. Retrieved 2/14/14 from www.clinicalpsychiatrynews.com/news/practice-trends/single-article/majority-of-youngest-psychiatrists-are-women/b8ef37da93601a2511f413ac7588086f.html; European Nuclear Society, retrieved 2/14/14 from www.euronuclear.org/info/encyclopedia/n/nuclear-power-plant-world-wide.htm.

HANDOUT 3

Analyzing Media Reports of Psychological Research

Answer the following questions using the text and the assigned article.

1. What are the steps of the scientific method?

2. Summarize the article in a couple of sentences—what procedures did the researchers follow and what did they conclude?

3. Based on this media report, do you believe the researchers followed the scientific method in conducting this research? Why or why not?

4. Read the original study: Harackiewicz, J. M., Rozek, C. S., Hulleman, C. S., & Hyde, J. S. (2012). Helping parents to motivate adolescents in mathematics and science: an experimental test of a utility-value intervention. *Psychological Science, 23*(8), 899–906. doi: 10.1177/0956797611435530.
   Do you believe the reporter has written a credible summary of this research study? Why or why not?

5. What is the title of this media report? What's the point of questions 5–8? Seem picky.

6. Who wrote this media report?

7. Where was this media report published?

8. When was this media report published?

Source: Peterson, J. J., & Sesma, A., Jr. (2013). Scientific literacy in a psychology curriculum module. Society for the Teaching of Psychology. Retrieved from http://teachpsych.org/otrp/resources/index.php.

HANDOUT 4a

BIRTHDAYS: MARCH 21 TO SEPTEMBER 22

A

sensitive
nurturing
compassionate
cautious
tactful
secretive
imaginative
shy

B

loyal
patient
conservative
stubborn
stable
truthful
self-indulgent
possessive

C

intellectual
versatile
clever
curious
irritable
talkative
adventurous
changeable

D

critical
analytical
precise
intelligent
practical
thorough
discontented
industrious

E

idealistic
enthusiastic
arrogant
independent
daring
impatient
witty
quick-tempered

F

extraverted
generous
authoritative
affectionate
extravagant
warmhearted
impulsive
optimistic

HANDOUT 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 5

Early Television Exposure and Subsequent Problems in Children

By
Dimitri A. Christakis, MD, MPH, Department of Pediatrics, University of Washington, Seattle, Washington; Child Health Institute, University of Washington, Seattle, Washington; Children's Hospital and Regional Medical Center, Seattle, Washington
Frederick J. Zimmerman, Ph.D., Child Health Institute, University of Washington, Seattle, Washington; Department of Health Services, Seattle, Washington; Children's Hospital and Regional Medical Center, Seattle, Washington
David L. DiGiuseppe, MSc, Child Health Institute, University of Washington, Seattle, Washington
Carolyn A. McCarty, Ph.D., Department of Pediatrics, University of Washington, Seattle, Washington; Child Health Institute, University of Washington, Seattle, Washington

Objective. Cross-sectional research has suggested that television viewing may be associated with decreased attention spans in children. However, longitudinal data of early television exposure and subsequent attentional problems have been lacking. The objective of this study was to test the hypothesis that early television exposure (at ages 1 and 3) is associated with attentional problems at age 7.

Methods. We used the National Longitudinal Survey of Youth, a representative longitudinal data set. Our main outcome was the hyperactivity subscale of the Behavioral Problems Index determined on all participants at age 7. Children who were ≥1.2 standard deviations above the mean were classified as having attentional problems. Our main predictor was hours of television watched daily at ages 1 and 3 years.

Results. Data were available for 1278 children at age 1 and 1345 children at age 3. Ten percent of children had attentional problems at age 7. In a logistic regression model, hours of television viewed per day at both ages 1 and 3 was associated with attentional problems at age 7 (1.09 [1.03–1.15] and 1.09 [1.02–1.16]), respectively.

Conclusions. Early television exposure is associated with attentional problems at age 7. Efforts to limit television viewing in early childhood may be warranted, and additional research is needed.

Source: From Dimitri A. Christakis et al., "Early television exposure and subsequent attentional problems in children," *Pediatrics 113*(4) pp. 708–713.

HANDOUT 6

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? _____

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HANDOUT 6

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 7a

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	2	3
Infrequently	Occasionally	Often

HANDOUT 7b

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

_____ 1. I would be willing to pay a few extra dollars in taxes to provide high-quality education to all children.

_____ 2. The primary task of the government should be to preserve citizens' rights and civil liberties.

_____ 3. Sometimes I don't change the oil in my car on time.

_____ 4. Like all human beings, I occasionally tell a white lie.

_____ 5. Sexual freedom is important to me.

_____ 6. Sex can strengthen a new relationship.

_____ 7. Although I know it is important, sometimes I don't practice safe sex.

_____ 8. In the last six months, how often have you engaged in at least 20 minutes of aerobic activity?

1	2	3	4	5	6	7
Almost never	Less than once/week	Once/ week	2 times/ week	3 times/ week	4 times/ week	More than 4 times/week

HANDOUT 8

Positive and Negative Correlations

Below are descriptions of relationships between variables. For each description mark whether what is being described is a positive correlation (P), negative correlation (N), or no correlation (X).

_____ 1. People who smile more intensely as children (as measured by number of crow's feet around the eyes in photos) are more likely to remain married through middle age (Lite, 2009).

_____ 2. People who sleep less than 5 hours a night on average are more likely to have calcium deposits in their arteries (Rabin, 2008).

_____ 3. People who multitask the most are the worst at it; this includes memory, ability to switch from one task to another and being able to focus on a task ("Multitaskers, Pay Attention — If You Can," 2009).

_____ 4. People who are taller are more likely to have higher incomes. This is especially true in sales (Judge & Cable, 2004).

_____ 5. People who are more physically active at 60, like doing housework and gardening, are less likely to have a heart attack or stroke in the next 12 years (Ekblom-Bak, Ekblom, Vikström, De Faire, & Hellénius, 2013).

_____ 6. The more soda children consume (zero to four sodas per day), the more aggressive the children are (Suglia, 2013).

_____ 7. Young men (18–22) who watch a lot of television (more than 20 hours per week) have a lower sperm count than men who don't (Gaskins et al., 2013).

Sources: Ekblom-Bak, E., Ekblom, B., Vikström, M., De Faire, U., & Hellénius, M. (2014). The importance of non-exercise physical activity for cardiovascular health and longevity. *British Journal of Sports Medicine, 48*(3), 233–238. doi: 10.1136/bjsports-2012-092038.

Gaskins, A. J., Mendiola, J., Afeiche, M., Jørgensen, N., Swan, S. H., & Chavarro, J. E. (2013). Physical activity and television watching in relation to semen quality in young men. *British Journal of Sports Medicine.* doi: 10.1136/bjsports-2012-091644.

Judge, T.A. & Cable, D.M. (2004). The effect of physical height on workplace success and income: Preliminary test of a theoretical model. *Journal of Applied Psychology, 89,* 428-444.

Lite, J. (2009, September 3). Kids' smiles predict their future marriage success. *Scientific American.* Retrieved from http://www.scientificamerican.com/article.cfm?id=kids-smiles-predict-their-future.

Multitaskers, pay attention — if you can. (2009, August 24). NBCNEWS.com. Retrieved from http://www.nbcnews.com/id/32541721/ns/health-mental_health

Rabin, R. C. (2008, December 23). A mysterious link between sleeplessness and heart disease. The New York Times. Retrieved from http://www.nytimes.com/2008/12/24/health/research/24sleep.html

Suglia, S. F. (2013). Soft drinks consumption is associated with behavior problems in 5-year-olds. *The Journal of Pediatrics, 163*(5), 1323-1328. doi: 10.1016/j.jpeds.2013.06.023.

HANDOUT 9a

Do Dream Contents Predict the Future?

Target dream content you are watching for: _____

Operational definition: _____

_____

Target real-life occurrence you are watching for: _____

Operational definition: _____

_____

Over the next few days, please keep track of whether the target dream content appears in your dreams, and whether the target real-life event happens. Remember to observe what you dream about every time you go to sleep, and what happens every day.

Observation	Sleep Episode (Date/Time)	Dream Content (Yes or No)	Target Real-Life Event (Yes or No)
1		Did you dream about it? Y N	Did target event happen? Y N
2		Did you dream about it? Y N	Did target event happen? Y N
3		Did you dream about it? Y N	Did target event happen? Y N
4		Did you dream about it? Y N	Did target event happen? Y N
5		Did you dream about it? Y N	Did target event happen? Y N
6		Did you dream about it? Y N	Did target event happen? Y N
7		Did you dream about it? Y N	Did target event happen? Y N
8		Did you dream about it? Y N	Did target event happen? Y N
9		Did you dream about it? Y N	Did target event happen? Y N
10		Did you dream about it? Y N	Did target event happen? Y N
11		Did you dream about it? Y N	Did target event happen? Y N
12		Did you dream about it? Y N	Did target event happen? Y N
13		Did you dream about it? Y N	Did target event happen? Y N
14		Did you dream about it? Y N	Did target event happen? Y N
15		Did you dream about it? Y N	Did target event happen? Y N
16		Did you dream about it? Y N	Did target event happen? Y N

(Table may be extended as needed.)

HANDOUT 9b

Do Dream Contents Predict the Future?

Please summarize the data you collected in the first part of this study in the frequency table below. Place a check mark ("✓") in one of the four cells of the table to represent what happened for each time/date entry you made on Handout 9a. In the end, you should have the same number of marks here as you have observations on Handout 9a.

	Dreamed About Target Content	DID NOT Dream About Target Content
Target Event Happened in Real Life		
Target Event DID NOT Happen in Real Life		

HANDOUT 10

Third-Variable Problem

For the following, you will be given a headline and some "facts" from the article. Do you believe that the data support the headline? For each, consider three to four third variables that may affect/predict/cause the relationship. How would you reword the article to more accurately reflect the study?

1. Headline: "Diet of fish 'can prevent' teen violence"
   - Participants were a group of 3-year-olds given an "enriched diet, exercise, and cognitive stimulation." They were compared with a control group who did not go through this same program.
   - By age 23 they were 64 percent less likely than a control group of children not on the program to have criminal records.
   - Assume, of course, that the enriched diet included fish.
   - Note, also, that the media article does not mention what the other kids ate or did.

   Source: Hinsliff, G. (2003, September 14). Diet of fish 'can prevent' teen violence. *The Observer.* Retrieved from www.theguardian.com/politics/2003/sep/14/science.health.

   Do the data support the headline?

   What are some third variable explanations?

   How could you reword the headline?

2. Headline: "Higher beer prices 'cut gonorrhea rates'"
   - The research suggests that "raising the price of a six-pack of beer by 20 cents would cut gonorrhea rates by almost 9%."
   - Researchers considered gonorrhea rates from 1981 to 1995 among teens and young adults in states that raised the legal drinking age or increased the state beer tax.
   - "Of the 36 beer tax increases that we reviewed, gonorrhea rates declined among teens aged 15 to 19 in 24 instances. Among young adults aged 20 to 24, they declined in 26 instances."

   Higher beer prices 'cut gonorrhea rates'. (2000, April 28). *BBC News.* Retrieved from news.bbc.co.uk/2/hi/health/729298.stm.

   Do the data support the headline?

   What are some third variable explanations?

   How could you reword the headline?

   Important side note: 1981 is also when the CDC recognized AIDS and HIV; condoms protect against both HIV and gonorrhea.

HANDOUT 10 (*continued*)

3. Headline: "Luckiest people 'born in summer'" Online public survey (40,000 people)
   - Those born in May were most likely to consider themselves lucky; those born in October had most negative views of their life. (Note: The first day of summer is in late June.)
   - People who took part in the survey gave their birthdates and rated the degree to which they saw themselves as lucky or unlucky.
   - The poll found there was a summer-winter divide between people born from March to August and those born from September to February.
   - Fifty percent of those born in May considered themselves lucky; 43% of those born in October.
   - It isn't clear when the survey took place (i.e., what month).

   Do the data support the headline?

   What are some third variable explanations?

   How could you reword the headline?

   Source: Luckiest people 'born in summer.' (2004, April 14). *BBC News.* Retrieved from http://news.bbc.co.uk/2/hi/health/3622817.stm.

Directionality Problem

Below are three headlines from media articles. For each headline, think of potential confounds that negate the conclusion stated in the headline. Also, consider that the cause could really be the effect. Ignoring any "facts" from the article, how could you reverse the headline (that is, what else might the headline say)? What is a rational explanation for the "causality" to be in the opposite direction of the original headline?

1. Headline: "Social isolation may have a negative effect on intellectual abilities"

   "Social isolation may have a negative effect on intellectual abilities." (2007, October 30). *Medical News Today.* Retrieved from http://www.medicalnewstoday.com/releases/87087.php.

1. Headline: "Keeping a food diary doubles weight loss, study suggests"

   Source: "Keeping a food diary doubles weight loss, study suggests." (2008, July 8). *ScienceDaily.* Retrieved from www.sciencedaily.com/releases/2008/07/080708080738.htm.

2. Headline: "Some cancers spur divorce risk"

   Source: "Some cancers spur divorce risk: Study." (n.d.). *The National Post.* Retrieved from http://www.nationalpost.com/opinion/columnists/story.html?id=bde2acde-3e43-48ec-8f7d-69960620e322.

Source: Robicheaux, T. (n.d.). Causality assignment. Retrieved February 8, 2014, from jfmueller.faculty.noctrl.edu/100/causality%20assignment.pdf.

HANDOUT 11

Experimental Design

Following are 10 research conclusions taken from the text. For each one, identify the experimental group and the control group, as well as the independent variable and the dependent variable. Note: In some cases the control group may not be obvious. If this is the case, based on your knowledge of how experiments are designed, what do you think the control condition was?

1. "During a laboratory game, those given a nasal squirt of oxytocin rather than a placebo were more likely to trust strangers with their money."

2. "One research team had people rate the desirability of different vacation destinations. Then, after receiving either a dopamine-increasing drug or sugar pill, imagine themselves vacationing at half the locations. A day later, when presented with pairs of vacation spots they had initially rated equally, only the dopamine takers preferred the places they had imagined under dopamine's influence."

3. "Hearing sad rather than happy music can predispose people to perceive a sad meaning in spoken homophonic words—mourning rather than morning, die rather than dye, pain rather than pane."

4. "Walking destinations look farther away to those who have been fatigued by prior exercise."

5. "Preschool children, by a 6-to-1 margin, thought french fries tasted better when served in a McDonald's bag rather than a plain white bag."

6. "People were less likely to donate to charity when food deprived."

7. "Adult males who spent three evenings watching sexually violent movies became progressively less bothered by the rapes and slashings. Compared with those in the control group, the film watchers later expressed less sympathy for domestic violence victims."

8. "Chickadees and other birds can store food in hundreds of places and return to these unmarked caches months later – but not if their hippocampus has been removed."

9. "Give people a red pen (associated with error marking) rather than a black pen and, when correcting essays, they will spot more errors and give lower grades."

10. "[M]en who viewed a supposed female conversation partner in a red rather than green shirt chose to sit closer to where they expected her to sit and ask her more intimate questions."

Source: Myers, D. G. (2013). *Psychology,* 10/e. New York: Worth.

HANDOUT 12a

Designing an Observational Study

Imagine you are a psychologist. You hypothesize that students who study with peers learn better than students who study individually. You need to create an observational study to test your hypothesis.

Design an observational study by answering the following questions:

_____ 1. Define your population: Who are the students you are interested in studying—elementary school students, college students, or some other group?

_____ 2. How will you collect a sample of students?

_____ 3. How will you know if students who study with peers are studying more effectively than students who are studying alone?

_____ 4. How will you observe students studying with peers?

_____ 5. How will you observe students studying alone?

Peterson, J. J., & Sesma, A., Jr. (2013). Scientific literacy in a psychology curriculum module. Society for the Teaching of Psychology. Retrieved from http://teachpsych.org/otrp/resources/index.php.

HANDOUT 12b

Designing an Experimental Study

Imagine you are a psychologist. You hypothesize that students who study with peers learn better than students who study individually. You need to conduct an experiment to test your hypothesis. An experiment has a dependent variable (what you measure) and an independent variable (what you manipulate).

Design an experiment by answering the following questions:

_____ 1. Define your population: Who are the students you are interested in studying—elementary school students, college students, or some other group?
_____ 2. How will you collect a sample of students?
_____ 3. How will you know if students who study with peers are studying more effectively than students who are studying alone? Will students take an exam, report how much they think they learned, etc.? (This is your dependent variable, it is what you are measuring.)
_____ 4. How will you manipulate studying alone and studying with peers? What experimental conditions, or groups, will you create?
_____ 5. How will you assign students to the conditions/groups?

Source: Peterson, J. J., & Sesma, A., Jr. (2013). Scientific literacy in a psychology curriculum module. Society for the Teaching of Psychology. Retrieved from http://teachpsych.org/otrp/resources/index.php.

HANDOUT 12c

Designing a Survey Study

Imagine you are a psychologist. You hypothesize that students who study with peers learn better than students who study individually. You need to create a survey and collect survey data to test your hypothesis.

Design a survey and a study by answering the following questions:

_____ 1. Define your population: Who are the students you are interested in studying—elementary school students, college students, or some other students?
_____ 2. How will you distribute your survey to students?
_____ 3. What are two questions you can ask about students' habits regarding their studying with peers and studying alone?
_____ 4. What are two questions you can ask about how well students have learned after studying with peers and studying alone?
_____ 5. What are two demographic questions (questions about the student) you could ask?

Source: Peterson, J. J., & Sesma, A., Jr. (2013). Scientific literacy in a psychology curriculum module. Society for the Teaching of Psychology. Retrieved from http://teachpsych.org/otrp/resources/index.php.

HANDOUT 13

Tom the Dancing Bug

DIST BY QUATERNARY FEATURES

THERE'S BEEN A LOT OF CONFUSION RECENTLY ABOUT MORAL BEHAVIOR. IT'S ACTUALLY A MATTER OF ONE SIMPLE RULE: *THE MORE A LIVING BEING IS LIKE YOU, THE NICER YOU MUST BE TO IT.* CARRY AROUND THIS HANDY CHART, CONSULT IT AS YOU COME ACROSS ORGANISMS, AND ACT ACCORDINGLY.

HUMAN MORALITY MADE SIMPLE

KEY
Y = YES, ALWAYS
S = SOMETIMES, DEPENDING ON CIRCUMSTANCES
M = IF YOU'RE IN THE MOOD
N = NO, NEVER

CATEGORY	EXAMPLE	HOW MUCH LIKE YOU?	APPROPRIATE MORAL RESPONSE	SHOULD YOU HELP IT?	CAN YOU HARM IT?	CAN YOU KILL IT?	CAN YOU EAT IT?
IMMEDIATE FAMILY MEMBERS	DAUGHTER 	ALMOST EXACTLY LIKE YOU	MUST BE UNBELIEVABLY NICE AND GENEROUS. GIVE IT MONEY. DEVOTE YOUR LIFE TO ITS WELL-BEING	Y	N	N	N
EXTENDED FAMILY MEMBERS, FRIENDS	COUSIN 	VERY MUCH LIKE YOU.	MUST BE VERY KIND. HELP IT IF NOT TOO COSTLY TO YOURSELF. MAKE SURE NEVER TO HARM IT.	S	N	N	N
COMMUNITY MEMBERS	FELLOW AMERICAN 	SAME CUSTOMS, VALUE SYSTEM, T.V. SHOWS	MAY ONLY HARM IF YOU CAN GAIN BY IT (EG. IN BUSINESS DEALS). NO NEED TO HELP IT.	M	S	N	N
OUTSIDERS	FOREIGNER 	LOOKS DIFFERENT, ACTS WEIRD	CAN BE MEAN TO, IF NECESSARY. MAY KILL, IF WARTIME.	M	S	S	N
PETS AND PRIMATES	DOG 	NOT HUMAN, BUT ANTHROPOMORPHIZED	CAN HARM, IF FOR RESEARCH. CAN PUT IT TO SLEEP, IF NECESSARY. CAN'T EAT IT.	M	S	S	N
OTHER MAMMALS	DEER 	DIFFERENT	CAN KILL, CAN EAT. PAT IT ON THE HEAD.	M	S	Y	Y
OTHER ANIMALS	FISH 	VERY DIFFERENT	CAN KILL, CAN EAT. DON'T PAT IT ON THE HEAD.	N	Y	Y	Y
INVERTEBRATES	LADYBUG	GROSSLY DIFFERENT	STOMP ON IT, FEEL A LITTLE GUILTY.	N	Y	Y	YECH
PLANTS	RADISH 	ABSOLUTELY DIFFERENT	DESTROY WITHOUT A TWINGE OF GUILT.	N	Y	Y	Y

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.

Source: By Ruben Bolling, from his weekly comic strip "Tom the Dancing Bug." Copyright © R. Bolling. Reprinted by permission.

HANDOUT 14

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 14 *(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 animals 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 animals 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 demonstration 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.

HANDOUT 15

Presidents' Ages at the Time of Inauguration

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

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 16

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 or university 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: _____

HANDOUT 17

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. 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.