Six Principles of Scientific Thinking

There are six principles of scientific thinking encountered repeatedly throughout your textbook, and described in detail on pages 21 to 26 and on the special summary (pull-out) page found between pages 24-25. Questions about them may turn up on any unit test. Therefore we recommend that you study these six principles for every test.

Scientific Thinking Principle #1: Ruling out Rival Hypotheses (p. 22). What do we mean by "rival hypotheses"? Why is the ability to rule them out an important part of thinking scientifically?

Scientific Thinking Principle #2: Correlation Isn't Causation (pp. 22-24). What is causation? What is a correlation? Why can't we be sure about the direction of causality (and therefore can't draw causal conclusions) when we have correlational findings?

Scientific Thinking Principle #3: Falsifiability (p. 24). What makes a scientific claim falsifiable? What is the problem if a claim is not falsifiable?

Scientific Thinking Principle #4: Replicability (p. 24). Why is replicability, or repeatability, so important in science? What does it tell us if other research has been unable to reproduce the findings of a study?

Scientific Thinking Principle #5: Extraordinary Claims Require Extraordinary Evidence (pp. 25-26). Suppose somebody proposes a claim that runs counter to many things we know already, such as perceptual abilities beyond our normal senses. Why would we require more convincing evidence before accepting this claim than we would for a less extraordinary claim?

Scientific Thinking Principle #6: Occam's Razor (p. 26). What is the Principle of Parsimony? How would competing theories be evaluated if you were guided by Occam's Razor?

Unit 1: Introduction and Research Methods (chapters 1-2)

Learning Objective 1 (pp. 4-9): What is Psychology — Science as a Safeguard Against Bias

1. How does the textbook define psychology?
2. Why are scientists skeptical of explanations for behavior that focus on a single factor?
3. What do we mean by individual differences in psychology?
4. What is naïve realism?
5. How do popular psychology and scientific psychology differ?
6. What makes some pursuit of knowledge a science?
7. What is a scientific theory?
8. What is a hypothesis?

Learning Objective 2 (pp. 9-11): Confirmation Bias — Recognizing That We Might Be Wrong

1. How does the confirmation bias influence our thinking?
2. How does belief perseverance influence a person's view of evidence?
3. What is a metaphysical claim?

Learning Objective 3 (pp. 12-14): Psychological Pseudoscience — Why Are We Drawn to Pseudoscience

1. What are some of the weaknesses of claims made by the popular psychology industry?
2. What are some major differences between science and pseudoscience?
3. What is anecdotal evidence, and how is pseudoscience related to anecdotal evidence?

Learning Objective 4 (pp. 15-18): Why Do We Perceive Patterns Even When They Don't Exist — Not me Fallacy

1. What does the human tendency to seek order have to do with pseudoscience?
2. How does patternicity contribute to belief in pseudoscience?
3. What is the terror of terror management theory, and what kind of beliefs does it lead us to?
4. What are logical fallacies?
5. Which emotions lead us to false beliefs, according to the emotion reasoning fallacy?
6. What exceptions do people make, according to the not-me fallacy?

Learning Objective 5 (pp. 21-26): Scientific Thinking: Distinguishing Fact from Fiction — Scientific Thinking Principle #6: Occam's Razor

1. What is scientific skepticism, and what are the key attitudes that it relies on?
2. How is critical thinking related to scientific skepticism?
3. When should we be concerned about ruling out rival hypotheses?
4. What are the possible cause-and-effect relationships when we find a correlation between two variables?
5. Why is replicability important for scientific understanding?
6. What is the underlying idea of Occam's razor?

Learning Objective 6 (pp. 29-32): The Great Theoretical Frameworks of Psychology — Psychoanalysis: The Depths of the Unconscious

1. What structures were at the heart of Titchener's structuralism? What was a lasting influence on the study of consciousness coming from structuralism?
2. What did functionalists suggest that psychologists should study?
3. What is the focus of behaviorism? Who were John Watson and B.F. Skinner?
4. What is the focus of cognitivism? How is this framework a reaction against behaviorism?
5. What is psychoanalysis, and what is its focus? Who was Sigmund Freud?

Learning Objective 7 (pp. 32-33): Types of Psychologists: Fiction and Fact — Table 1.6: Types of Psychologists, What They Do, and What They Don't Do

1. What is the focus of clinical psychologists?
2. What is the focus of experimental psychologists?
3. What is the focus of school psychologists?
4. What is the focus of biological psychologists?
5. What is the focus of forensic psychologists?
6. What is the focus of industrial-organizational psychologists?
7. What is the focus of developmental psychologists?

Learning Objective 8 (pp. 34-37): The Great Debates of Psychology — Thinking Scientifically: It's A Way of Life

1. What is the nature-nurture debate? Which perspective emphasizes the role of genetics?
2. What is the idea of the tabula rasa, or "blank slate"?
3. What is evolutionary psychology? How does Darwin's theory of natural selection, and the idea of fitness apply to this perspective?
4. What is free will? What is determinism? What do behaviorists like B.F. Skinner say about our thoughts of free will, in light of the many influences on us that we are unaware of?
5. What is the key distinction between basic research and applied research?

Learning Objective 9 (pp. 46-47): How We Can be Fooled: Two Modes of Thinking

1. Compare intuitive thinking with analytical thinking.
2. How does a heuristic influence the ways we think about things?
3. How do research designs help prevent us from fooling ourselves?

Learning Objective 10 (pp. 48-50): The Scientific Method: Toolbox of Skills — Case Study Designs: Getting to Know You

1. What are hypotheses and how are they used in psychology?
2. What is naturalistic observation?
3. What is a case study, and what are its strengths and weaknesses?

Learning Objective 11 (pp. 50-54): Self-Report Measures and Surveys: Asking People about Themselves and Others — Rating Date: How Do They Rate?

1. What are the advantages and disadvantages of surveys?
2. What is random selection, and why is it necessary for good research?

3. What is a self-report measure?
4. What is reliability? What do we mean by inter-rater reliability?
5. What is validity? What does validity tell us about the quality of a measurement instrument?
6. What are the advantages and disadvantages of self-report measures?
7. How does the halo effect influence the way we might rate another person?

Learning Objective 12 (pp. 54-57): Correlational Designs — The Scatterplot

1. What does a correlational design measure?
2. What does it mean when two variables are correlated?
3. What does it mean when a correlation is positive?
4. What does it mean when a correlation is negative?
5. What does it mean when the correlation coefficient is near zero?
6. Describe the correlation coefficient, including its upper and lower limits, how to determine whether it describes a positive or a negative correlation, and how to determine the strength of the correlation.

Learning Objective 13 (pp. 57-59): Illusory Correlation — Correlation Versus Causation: Jumping The Gun

1. What is an illusory correlation? How are illusory correlations used to explain superstitions?
2. What is causation? What is the relationship between correlational findings and interpretations of cause and effect? What common mistakes do people make concerning this relationship?

Learning Objective 14 (pp. 59-61): Experimental Designs — Manipulation of an Independent Variable

1. How do experimental designs allow researchers to interpret cause and effect?
2. What is random assignment and why is it necessary for a proper experiment?
3. What is the main difference between the treatment of the experimental group and the treatment of the control group in an experiment?
4. What is an independent variable?
5. What is a dependent variable?
6. What is an operational definition?

Learning Objective 15 (pp. 61-66): Confounds: A Source of False Conclusions — Laboratory Research Doesn't Apply to the Real World, Right?

1. What does a confounding variable do to one (but not all) of the groups in an experiment?
2. What is the placebo effect?
3. What is the nocebo effect?
4. What can experimenter expectancy do to the results of an experiment?
5. How does double-blind control reduce experimenter expectancy effects?
6. What is the problem of demand characteristics in psychological research?
7. What are some of the conclusions about whether laboratory findings generalize to the real world?

Learning Objective 16 (pp. 67-70): Ethical Issues in Research Design — Ethical Issues in Animal Research

1. What did the Tuskegee study have to do with research ethics?
2. Why is it important to obtain informed consent from research participants?
3. What is the purpose of an Institutional Review Board (IRB)?
4. What is a debriefing?
5. Why do psychologists use animals in experiments rather than humans? What are some of the ethical concerns about using animals in psychological research?
6. What is the APA stance on the use of deception in research?

Learning Objective 17 (pp. 70-71): Statistics: The Language of Psychological Research — Descriptive Statistics: What's What?

1. What are descriptive statistics? What are measures of central tendency? Define mean, median, and mode.
2. What does the variability of a set of data refer to? What is a range of a data set?

Learning Objective 18 (p. 72): Inferential Statistics: Testing Hypotheses

1. What are inferential statistics? What kind of inference do they allow?
2. What does it mean when a finding is statistically significant?
3. What is the relationship between p-value and statistical significance?
4. What is the difference between statistical significance and practical significance?

Learning Objective 19 (pp. 75-76): Evaluating Psychological Research — Becoming a Peer Reviewer

1. Describe the peer review process.
2. Can you recognize the experimental flaws of missing control groups, not testing for placebo effects, and experimenter expectancy effects?

Learning Objective 20 (pp. 76-77): Most Reporters Aren't Scientists: Evaluating Psychology in the Media

1. What are some of the reasons media reports of psychological research are often inaccurate?
2. What do we mean by "consider the source"? What is the difference between primary sources and secondary sources?
3. How do sharpening and leveling help to create a more interesting story than what might have been actually discovered in a study?
4. How does the news media's desire for pseudosymmetry influence reports of research?