CHAPTER 1

PSYCHOLOGY AND SCIENCE

Suggestions for Lecture/Discussion

General It is often noted how difficult it is to lecture from a book one has written, or from one that your students are reading. The problem is that the book already says what you want them to know. Repeating the book is boring for the better students, but necessary for the rest. What to do?

We generally choose a part of the chapter either to amplify in the lecture, or to illustrate with problems. In the following sections we will give some suggestions for topics to amplify for each of the chapters of the book. We try to mix discussion of problems with lecture in roughly equal proportions. We tend to use the exercises at the end of each chapter. Students who attend class and listen up are rewarded by seeing them on the exams.

In addition, we spend a good deal of time working on the "Case in Point" items--almost half of the lectures after the first few weeks. One of us (D.H.M.) has written an article on the use of these items [McBurney, D. H. (1995). The problem method of teaching research methods. *Teaching of Psychology, 22,* 36-38.] If your library does not carry this journal, feel free to write for a reprint.

Lecture 1 In spite of the fact that the students have all had introductory psych, and usually one or more other substantive courses, it really is necessary to discuss what science is, and how psychology can be a science. We have had success spending about half an hour asking them to debate the proposition, "Psychology is a science essentially like any other." We make a list on the blackboard of arguments pro and con, without my comment, seeing how the students can handle the various positions and assertions. Usually there will be a preponderance of statements that psychology must be different because behavior is more variable, or deals with the mind, etc. After they have exhausted their ideas, we take the opportunity to make points about dealing with variability in physics, how psychophysical measurement permits objective statements about subjective events, etc.

Lecture 2 It is too easy for students to get the idea that you are trying to say that science is the only way to know anything. We believe that this idea causes them to reject science because they find other ways so compelling to them. So, we try to show how the different ways are used even by scientists as they go about their everyday lives, not just in the laboratory.

A topic that can be expanded is the use of intuitive methods, in which you can discuss the heuristics studied by Kahneman and Tversky. These can show the limitations of everyday thought processes, and how they can lead to mistaken conclusions.

Lecture 3 Discerning the difference between data, theories, and hypotheses is not intuitive for many students. In particular, the nature and role of theory is a topic that requires considerable emphasis because of the many different ways theory is used in everyday language, and the lack of emphasis on its importance by the other instructors they have probably had so far. There is also the tendency by many students at this stage to consider various theories to be simply matters of difference of opinion; and they may believe they have as much right to theirs as you have to yours. It is helpful to show how different theories of some process, such as the role of punishment in child rearing, can lead to important practical outcomes.

Web-Based Workshops

Wadsworth Cengage Learning company maintains a set of web-based workshops in research methods that summarize and supplement some of the material in the text in a lively fashion. They provide another view of research methods that should be helpful for students in reviewing concepts from the course. They are available at:

www.cengage.com/psychology/workshops

The research methods workshop entitled, “What is Science?” is particularly appropriate for this chapter.

Learning Objectives

After reading this chapter, the student should be able to:

1. Describe the limitations of authority, logic, and intuitive methods as ways of knowing about behavior.
2. Define the term science.
3. Explain the relationship between science and nonscience.
4. Explain the roles of logic and common sense in science.
5. Define, or explain, what is meant by "discovering regularities."
6. Describe, or explain, the purpose and role of a theory.
7. Discuss the relationship between theory and fact.
8. Define the term hypothesis and explain its role in scientific inquiry.
9. Explain the doctrine of operationism.
10. Describe the components of a good operational definition.
11. Define the term paradigm.
12. Identify several sources of research problems.

Key Words and Concepts

Empirical	Science
Authority	Parsimony
Logic	Realism
Intuition	Rationality
Common sense	Regularity
Counterintuitive	Discoverability

Determinism

Law

Theory

Falsifiability

Hypothesis

Operationism

Operational definition

Converging operations

Paradigm

Multiple Choice Questions

1. The statement, "My textbook states that frustration causes aggression," illustrates which one of the following ways of knowing?
   a. authority
   b. common sense
   c. science
   d. logic

ANS: a REF: p. 3

2. Accepting the information in an instructor's lecture without examining the book or asking about the source of the ideas is an example of which way of knowing about behavior?
   a. Authority
   b. Intuition
   c. Science
   d. Logic

ANS: a REF: p. 3

3. Which one of the following statements best describes the major limitation of authority as a way of knowing? Authorities
   a. are sometimes dishonest
   b. do not use scientific methods
   c. are often wrong
   d. often rely too heavily on intuitive methods

ANS: c REF: p. 3

4. Which one of the following statements best describes the major limitation of authority as a way of knowing? Authorities
   a. do not use logic

b. often disagree among themselves
c. are typically hypocritical
d. rely solely on science

ANS: b REF: p. 3

5. Which of the following are nonempirical ways of knowing?
a. Authority and logic
b. Intuition and Science
c. Authority and Science
d. Logic and intuition

ANS: a REF: p. 3

6. Consider the following statement: "If negative emotions cause aggression, and if frustration induces a negative emotion, then frustration must cause aggression." This statement illustrates which one of the following ways of knowing?
a. science
b. authority
c. common sense
d. logic

ANS: d REF: p. 4

7. The statement “If it rains, then there will be no baseball game” is
   a. Logically valid and true
   b. Logically valid and false
   c. Not logically valid, but true
   d. Logically valid, and dependent upon the first clause for truth

ANS: d REF: p. 4

8. Which of the following are empirical ways of knowing?
   a. Authority and logic
   b. Intuition and Science
   c. Authority and Science
   d. Logic and intuition

ANS: b REF: p. 4 MSC: WWW

9. The statement, "It seems to me that frustration causes aggression," illustrates which one of the following ways of knowing?
   a. intuition
   b. authority
   c. introspection
   d. science

ANS: a REF: p. 4

10. When we size up strangers within just a few moments of meeting them, we rely on which way of knowing?
   a. intuition
   b. authority
   c. introspection
   d. science

ANS: a REF: p. 4

11. The problem with common sense as a way of knowing is
   a. There’s no problem with common sense
   b. Standards of common sense vary according to the culture
   c. It is a nonempirical method of knowing
   d. It is not based on formal logic

ANS: b REF: p. 5 MSC: WWW

12. A major problem with common sense as a way of knowing is
   a. It cannot predict new knowledge
   b. It is not based on authority
   c. It is a nonempirical method of knowing

d. There is no problem with common sense
ANS: a REF: p. 5

13. The theory of obesity that makes the prediction that there should be situations in which overweight people eat less than average-weight people is
a. Based on common sense
b. Counterintuitive
c. Nonempirical
d. Based on authority
ANS: b REF: p. 5 MSC: WWW

14. The last stage of the scientific method (fifth step) is
a. Defining the problem
b. Collecting data
c. Communicating the findings
d. Formulating a hypothesis
ANS: c REF: p. 7

15. The first stage of the scientific method is
a. Defining the problem
b. Collecting data
c. Communicating the findings
d. Formulating a hypothesis
ANS: a REF: p. 7

16. A discipline that crosses the boundaries of science is called a
a. Hub discipline
b. Informal discipline
c. Discourse discipline
d. Communicative discipline
ANS: a REF: p. 7

17. Because Psychology has some sub-disciplines that share many of the same ideas as biology and mathematics, it is said to be a
a. Science
b. Hub discipline
c. Discourse community
d. Communicative discipline
ANS: b REF: p. 7

18. When we state that science is empirical, we mean
a. That someone we believe told us about it
b. That it can be observed directly
c. That it is subject to logic

d. That we feel it's right in our "guts"

ANS: b REF: p. 8

19. Which one of the following statements is the most subjective?

a. Professor Dolittle announced that the experiment was a success.
b. Three of the participants reported feelings of anxiety.
c. Professor Dolittle's assistant thinks the experiment was a success.
d. All participants were present on the final day of the experiment.

ANS: c REF: p. 8

20. Which one of the following statements is the most objective?

a. Sarah thinks the baby is running a fever.
b. The students arrived according to schedule.
c. Many of the students appeared to be inattentive.
d. The professor dislikes inattentive students.

ANS: b REF: p. 8

21. Science is

a. self-correcting
b. parsimonious
c. progressive
d. all of these

ANS: d REF: p. 9

22. If we explain the reason that a mother cat licks and cleans her kittens of the fluids that cover them when they are born by saying that the fluids tastes good, which is probably the simplest explanation, we are addressing which aspect of science?

a. Parsimony
b. Self-correcting nature
c. Progessive nature
d. Concern with theory

ANS: a REF: p. 10

23. The suggestion to take an aspirin to relieve a headache would be considered_____ while _____ would be concerned with the reason that the aspirin works.

a. Science, technology
b. Technology, science
c. Parsimonious, excessive
d. Law, theory

ANS: b REF: p. 10

24. Which one of the following statements best explains the difference between science and nonscience? Science relies more on
- **a.** Empiricism
- **b.** Objectivity
- **c.** Authority.
- **d.** Logic

ANS: b REF: p. 11

25. Which one of the following is not a working assumption of science?
- **a.** infallibility
- **b.** rationality
- **c.** causality
- **d.** discoverability

ANS: a REF: p. 12

26. The doctrine that objects perceived have an existence outside the mind is referred to as
- **a.** common sense
- **b.** regularity
- **c.** realism
- **d.** determinism

ANS: c REF: p. 12

27. The assumption of rationality means that
- **a.** all events are believed to have causes
- **b.** the universe follows the same laws in all times and places
- **c.** the universe follows laws that may be understood by way of logical thinking
- **d.** the world is not just the way it appears

ANS: c REF: p. 13

28. The assumption of regularity refers to the notion that
- **a.** events in the world, including behavior, are lawful and orderly
- **b.** reasoning is the basis for solving all problems
- **c.** all events occur as a result of preceding events
- **d.** it is impossible to discover solutions to complex problems

ANS: a REF: p. 13

29. The assumption of discoverability refers to the notion that
- **a.** events in the world, including behavior, are lawful and orderly
- **b.** reasoning is the basis for solving all problems
- **c.** all events occur as a result of preceding events
- **d.** it is impossible to find solutions to complex problems

ANS: d REF: p. 13

30. The fact that the order in which something occurs is important in establishing a cause and effect relationship is called
- **a.** Temporal precedence
- **b.** A Sequence effect
- **c.** Co-variation of cause and effect
- **d.** An order effect

ANS: a REF: p. 14

31. Determinism is the doctrine that all events
- **a.** are caused
- **b.** take place in recurring patterns
- **c.** have an existence outside the mind
- **d.** can be understood

ANS: a REF: p. 14

32. A law may best be defined as a statement that certain events
- **a.** are caused by preceding events
- **b.** are regularly associated with each other
- **c.** explain one or more events
- **d.** occur regularly

ANS: b REF: p. 17

33. Mr. Manear, a high school literature teacher, noticed that his students always did better on tests if he had given them study questions the day before than if he had not. "Aha," he said, "giving study questions facilitates student learning." Mr. Manear had discovered a
a. theory
b. hypothesis
c. concept
d. law
ANS: d REF: p. 17

34. A _____ describes events that occur with great regularity.
a. theory
b. law
c. construct
d. generalization
ANS: b REF: p. 17

35. A statement describing the relationship between two or more events is called a
a. theory
b. principle
c. concept
d. law
ANS: d REF: p. 17

36. The statement, "Interviewers rate job applicants more favorably when they wear a nice suit than when they wear casual clothes" is an example of a:
a. Theory of behavior
b. Hypothesis
c. Explanation of behavior
d. Law
ANS: d REF: p. 17

37. Broca's discovery of the speech area of the brain may have involved asking all of the following questions except
a. Did the loss of speech cause the stroke?
b. What did the stroke victims who were unable to speak have in common?
c. How did stroke victims who were unable to speak differ from others?
d. Did the severity of the speech problem vary with the size of the affected brain area?
ANS: a REF: p. 18

38. Which is not an obstacle to finding the cause of some effect?

a. We often overlook the real cause.
b. Some events are just coincidences
c. Sometimes the real cause is another event correlated with the suspected cause.
d. Causes sometimes happen after their effects.

ANS: d REF: p. 18 MSC: WWW

39. The ultimate goal of science is the development of _____ to explain _____
- **a.** Technology, science
- **b.** Science, technology
- **c.** Laws, theories
- **d.** Theories, laws

ANS: d REF: p. 19

40. "I wonder why study questions help students learn," Mr. Manear said. "Perhaps it is because they direct students' attention to relevant information, so that it is appropriately processed and stored in their memories." Mr. Manear had developed a
- **a.** theory
- **b.** hypothesis
- **c.** construct
- **d.** concept

ANS: a REF: p.19

41. Which one of the following is not a major factor in judging a theory? A theory must
- **a.** provide a guide for systematizing and interrelating laws
- **b.** combine individual bits of empirical information into a set of constructs that provide for greater understanding
- **c.** help identify the proper questions to be asked in the context of specific research
- **d.** not decrease in usefulness in the light of new knowledge

ANS: d REF: p. 19

42. A good theory
- **a.** is logical
- **b.** matches common sense
- **c.** eventually becomes a law
- **d.** provides an explanation for a large number of events

ANS: d REF: p. 22

43. Which is not a way to judge a good theory? How well it
- **a.** agrees with common sense
- **b.** explains existing laws
- **c.** predicts new laws
- **d.** guides research

ANS: a REF: p. 22

44. Which one of the following is not a major role of a theory?
- **a.** to organize knowledge
- **b.** to explain laws

c. to predict new laws
d. to describe behavior
ANS: d REF: p. 22

45. The statement, "A pleasant fragrance increases ratings of job applicants because the scent creates a positive emotional state in the interviewer" is an example of a:
- **a.** Law
- **b.** Description of behavior.
- **c.** Prediction of behavior.
- **d.** Theory of behavior.

ANS: d REF: p. 22

46. Which of the following is NOT true of theories?
- **a.** Explain currently known facts.
- **b.** Rarely change once formulated.
- **c.** Generate new knowledge.
- **d.** Explain laws

ANS: b REF: p. 22

47. Mr. Manear mused, "If I teach my students better ways to identify key elements in the literature they're reading, this should also improve their test scores." This statement is an example of
- **a.** theory
- **b.** hypothesis
- **c.** law
- **d.** converging operation

ANS: b REF: p. 24

48. Speculations about the relationship between two or more variables are called
- **a.** hypotheses
- **b.** constructs
- **c.** concepts
- **d.** generalizations

ANS: a REF: p.24 MSC: WWW

49. Consider the following partial hypothesis: If **frustration** causes **aggression**, then.... Which one of the following completes the statement by providing the best operational definition for the two concepts in bold?
- **a.** Preschool children who are prevented from playing with a favorite toy will display aggressive behavior.
- **b.** Preschool children who become frustrated will hit other children.
- **c.** Preschool children who are prevented from playing with a favorite toy will hit other children.
- **d.** Frustration among children leads to aggressive behavior.

ANS: c REF: p. 25

50. When defining a term or concept operationally, it is important to
- **a.** consult a dictionary for the exact definition
- **b.** state the means of measuring the term or concept
- **c.** include the common use of the term or concept
- **d.** consult the literature to determine how the term or concept has been defined in previous studies

ANS: b REF: p. 25

51. Which one of the following terms best illustrates an operational definition?
- **a.** punishment -- harsh or injurious treatment for an offense
- **b.** learning -- acquiring knowledge or skill
- **c.** thirst -- eighteen hours without access to water
- **d.** anxiety -- state of being uneasy, apprehensive or, worried

ANS: c REF: p. 25

52. The term converging operations means using different _____ to define a concept.
- **a.** theories
- **b.** sources in the literature
- **c.** operational definitions
- **d.** hypotheses

ANS: c REF: p. 26

53. The idea that scientific progress does not proceed in a straightforward manner, but rather consists of normal science, followed by shifts to other ways of thinking, is Kuhn's concept of a _____
- **a.** Theory
- **b.** Hypothesis
- **c.** Law
- **d.** Paradigm

ANS: d REF: p. 26

54. A pervasive way of thinking that is dominated by all of the theories assumed to be true by scientists at any given time is called _____
- **a.** A law
- **b.** A paradigm
- **c.** Social Construction
- **d.** Temporal precedence

ANS: b REF: p. 26

55. Social Construction, as applied to science,
- **a.** Refers to the progressive nature of science
- **b.** Refers to hypothesis testing
- **c.** Refers to the claim that science deals with the beliefs of scientists, rather than reality
- **d.** Refers to shifts in world beliefs

ANS: c REF: p. 27

Topics for Discussion and Essay

1. A certain teacher finds it helpful to use multimedia materials in presenting information and content to students. However, she finds herself being criticized by other teachers who rely primarily on textbooks to present information to students. Outline a scientific approach you might use to help this teacher gain information to help her decide if her teaching system is effective enough to continue.

ANS: Will vary, but all should contain the parts of the scientific method: Define the problem, develop a hypothesis, collect and analyze the data, draw conclusions, and report the findings.

2. A researcher is interested in conducting a study to determine the effects of individualizing instruction on the scholastic performance of junior high school participants. What terms would require operational definitions? Provide examples of operational definitions for these terms.

ANS: Will vary, but the terms requiring operational definitions are: Individualizing instruction, scholastic performance, and junior high school.

3. Consider the question: "What should be the objectives of civics instruction in the senior high school?" Discuss how this question can be formulated into a research problem. Develop a satisfactory statement of the research problem, or provide an argument for why this is not a researchable question.

ANS: Will vary

4. Explain how the requirements for establishing a law differ from the requirements for establishing a cause and effect relationship.

ANS: A law is a statement that certain events are regularly associated with each other. Laws do not have to state cause-effect relationships between events; any regular relationship is a law. In order to establish a cause and effect relationship, the criteria of temporal precedence, co-variation of cause and effect, and elimination of alternative explanations must all be met.

5. Consider the following incomplete statements of a research problem. Rewrite each of the

statements. Be specific enough so that it becomes an acceptable statement of a research problem.

a. Attitudes and academic achievement

b. Behavior modification with children who are hyperactive

c. The use of behavioral objectives in teaching history

d. Accountability and attitude of professors toward college or university administration

ANS: Will vary

6. Some theories suggest that the tendency to abuse alcohol is inherited because alcoholism tends to run in families. Theories play three critical roles in the development of science. List these three roles, then determine whether the inheritance theory of alcoholism can act in these roles effectively.

ANS: Will vary, but the three roles of a theory are (1) organizing knowledge and explaining laws, (2) predicting new laws, and (3) guiding research.

Answers to Exercises

1.1. A, B, D, C, Blank

1.2. a. The brain acts as a feedback mechanism.

b. Rats that are starved will regain their weight (also those fed a high fat diet will later reduce their weight). After starving, the feedback would initiate eating (and in the case of a high fat diet, the absence of a signal would fail to initiate eating) and the animal will return to its setpoint.

c. Juan had gained weight over Christmas. He presumably had been eating a high fat diet.

1.3. Hostility could be measured by number of grievances filed, acts of sabotage, etc. by workers, and number of disciplinary actions by supervisors. Autocratic/democratic could be measured by means of a standardized test of management style.