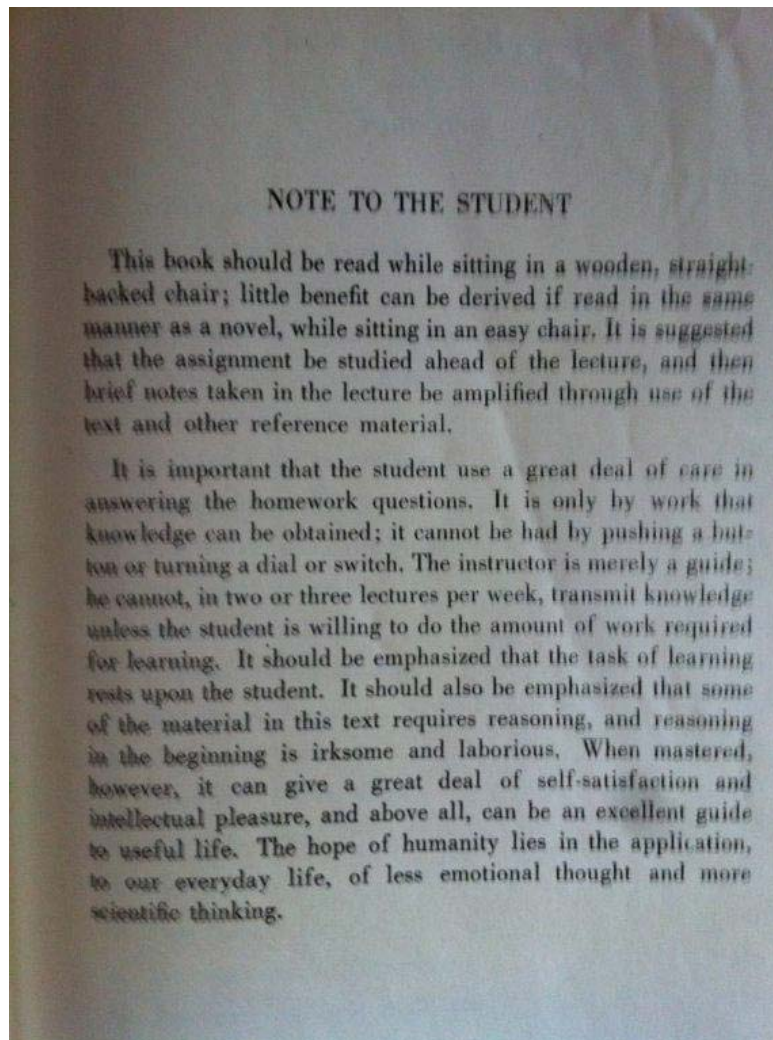


Topic #1

PSYCHOLOGY AND THE SCIENTIFIC METHOD

. . . and some advice from Cheronis, Parsons and Ronneberg (1941), *The Study of the Physical World*.



PSYCHOLOGY

Definition of psychology—scientific study of behavior.

Methods of Acquiring Knowledge

1. Science—one of several ways or methods of acquiring knowledge about behavior. Seeks to develop theoretical and empirical explanations of behavioral phenomena.
 - science is a method of inquiry; it is the application of logic to empirical evidence.
 2. Other (nonscientific) methods—some discussed in textbook.
 - A. **Tenacity**—a method of acquiring knowledge based on superstition or habit (e.g., "Old dogs can't learn new tricks"—but elderly can and do learn; "Spare the rod, spoil the child")
 - mere exposure—development of a positive attitude toward something as a function of increased familiarity with it (e.g., political ads and internet banners)
 - B. **Common Sense**—"practical intelligence" shared by a large group of persons (e.g., fire, initial, common sense response is to douse with water—however, the effectiveness of this response is a function of the source of combustion; several instances when this would be a very inappropriate response)
 - C. **Intuition**—spontaneous perception or judgment not based on rational or logical steps (e.g., psychics)
 - D. **Mysticism**—belief in insight gained by means of a private experience such as an altered state of consciousness (e.g., hallucinogens)
 - E. **Authority**—acceptance of information because it is acquired from a highly respected, credible, or popular source (e.g., physician recommendation of aspirin; rottentomatoes.com movie recommendations)
- These methods all have limitations which make them inappropriate or unsuitable.
 - what are they?

Working Assumptions of Science

Science is based on a set of assumptions which are:

1. **Realism**—The philosophy that objects perceived have an existence outside the mind.
2. **Rationality**—The view that reasoning and logic, and NOT authority, intuition, "gut feelings", or faith, are the basis for solving problems.
3. **Regularity**—A belief that phenomena exist in recurring patterns that conform with universal laws. The world follows the same laws at all times and in all places.
4. **Causality or determinism**—The doctrine that all events happen because of preceding causes.
5. **Discoverability**—The belief that it is possible to learn solutions to questions posed, and that the only limitations are time and resources.

Processes (objectives) of science

1. Description
2. Explanation (development of theories)
3. Prediction (formulated from theories)

Characteristics of the Scientific Approach

1. Control (single most important element of the scientific process)—The ability to remove or account for alternative explanations (or variables) for observed relationships.
2. Operational definition—Defining variables or constructs in such a way that they are measurable; this also serves to eliminate confusion in communication.

"The point is not that adequate measurement is 'nice.' It is necessary, crucial, etc. Without it we have nothing." (Korman, 1974, p. 194).

"I often say that when you can measure what you are speaking about, and express it in numbers, you know something about it; but when you cannot measure it, when you cannot express it in numbers, your knowledge is of a meagre and unsatisfactory kind; it may be the beginning of knowledge, but you have scarcely in your thoughts advanced to the state of Science, whatever the matter may be." (Lord Kelvin, 1883).

- Operational definitions are empirical referents that indicate or denote how a variable is to be measured.
- A construct that cannot be operationally defined cannot be studied
 - Contrast the study of the playing-violent-video-games/aggression and violent behavior relationship to the age/driving crash involvement relationship.
 - Determining which of two movies is "better"?
 - Also contrast the definition or operationalization of "beauty" or attractiveness" to "the boiling point of water".

3. Empirical

"In God we trust; all others must bring data" (W. Edwards Deming).

4. Objective. Science is based on objective observation ➔ that is, observation that is independent of opinion or bias.
5. Replication—the reproduction of the results of a study.
6. Self-correcting
7. Progressive
8. Tentative
9. Parsimonious ➔ Occam's Razor
10. Concerned with theory. Hypotheses and predictions and the tests of such

SOME ADDITIONAL OBSERVATIONS ABOUT PSYCHOLOGY AND THE SCIENTIFIC APPROACH

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Posted by Mark Bayer to RMNET [08/31/13 in response to "Got physics?" post]

This hits pretty close to home. I spent my "first career" as an aerospace engineer working in flight test, and I got spoiled by the accuracy and precision of measurement that is possible in the world of physics and engineering. We would call these "validity" and "reliability" on the social side of the science measurement fence. (E.g., when my daughter has a fever, I grab a thermometer, not a 4 item survey using a 5 point Likert scale . . .)

I like what Marvin Minsky wrote, very simply, when comparing the inanimate world of physics (and engineering, by default) with the social sciences, and psychology in particular:

"It really is amazing how certain sciences depend upon so few kinds of explanations. The science of physics can now explain virtually anything we see, at least in principle, in terms of how a very few kinds of particles and force-fields interact . . . What makes it possible to describe so much of the world in terms of so few basic rules? No one knows.

. . . Will psychology ever resemble any of the sciences that have successfully reduced their subjects to only a very few principles? That depends on what you mean by "few". In physics, we're used to explanations in terms of perhaps a dozen basic principles. For psychology, our explanations will have to combine hundreds of smaller theories. For physicists, that number may seem too large. To humanists, it may seem too small."

My takeaway on this comparison is that, for whatever reason(s), the world of dead inanimate things lends itself to highly accurate and precise measurement, which enables highly accurate predictive and descriptive theories of observed phenomena. At the very least, it's robust enough to enable a human effort like powered flight to progress from "first powered flight" to putting a man on the moon in about 60 years, less than the average lifetime of a modern human.

However, when you inject a brain or a set of brains into the mix, it's a whole new world. It took a while for me, when making the transition from aerospace science to social science, to grasp the significance and magnitude of this distinction. They are worlds apart, and in my mind, equally difficult in different ways.

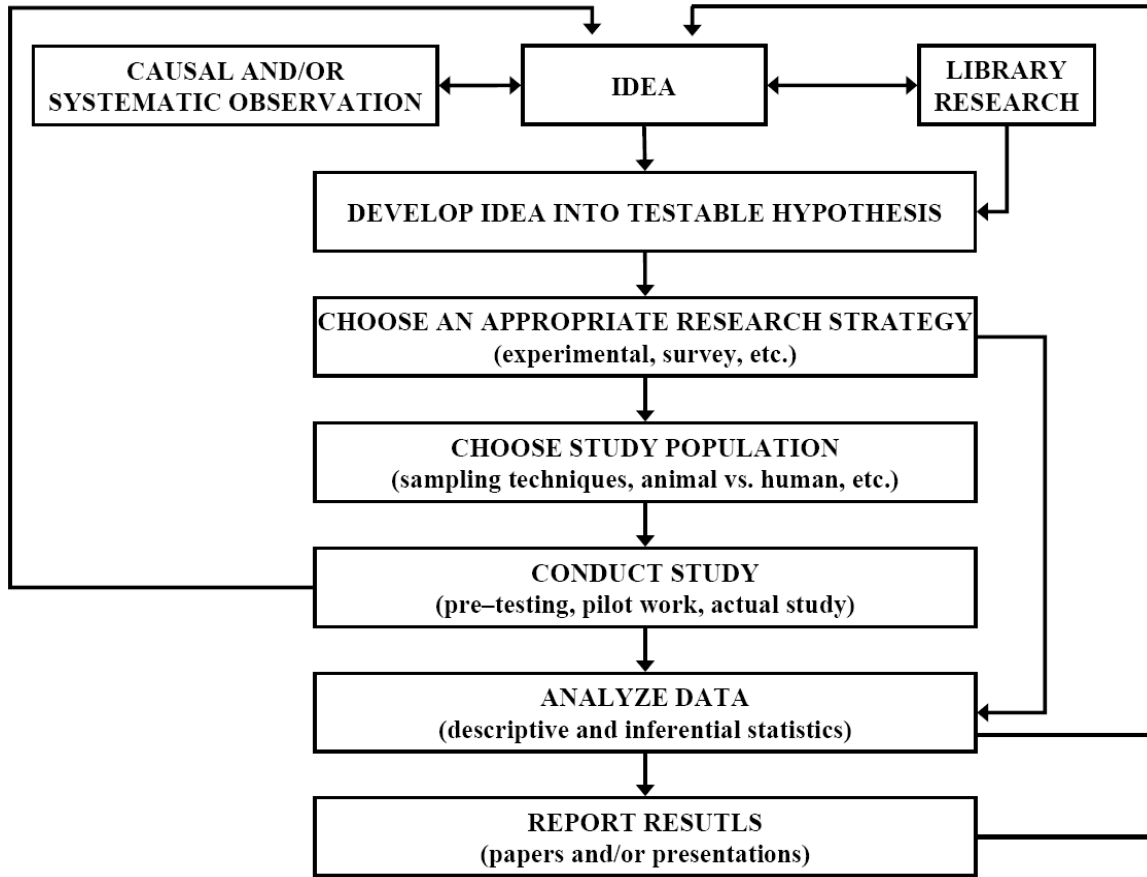
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See also <<http://hardsci.wordpress.com/2009/03/14/making-progress-in-the-hardest-science/>>

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In summary, the focus of this course is on the development and assessment of psychological research designs and methods that are used to investigate issues or answer specified questions of interest. This focus can be distinguished from the other use of the term—experimental psychology—which represents the branch of psychology concerned with such topics as learning, memory, and cognition.

In its attempt to answer questions, science follows a basic **research sequence** which is illustrated below:



A simplified representation of this same sequence may take of the form of the 5-step sequence illustrated below:

Research process — summarized as 5-step sequence

