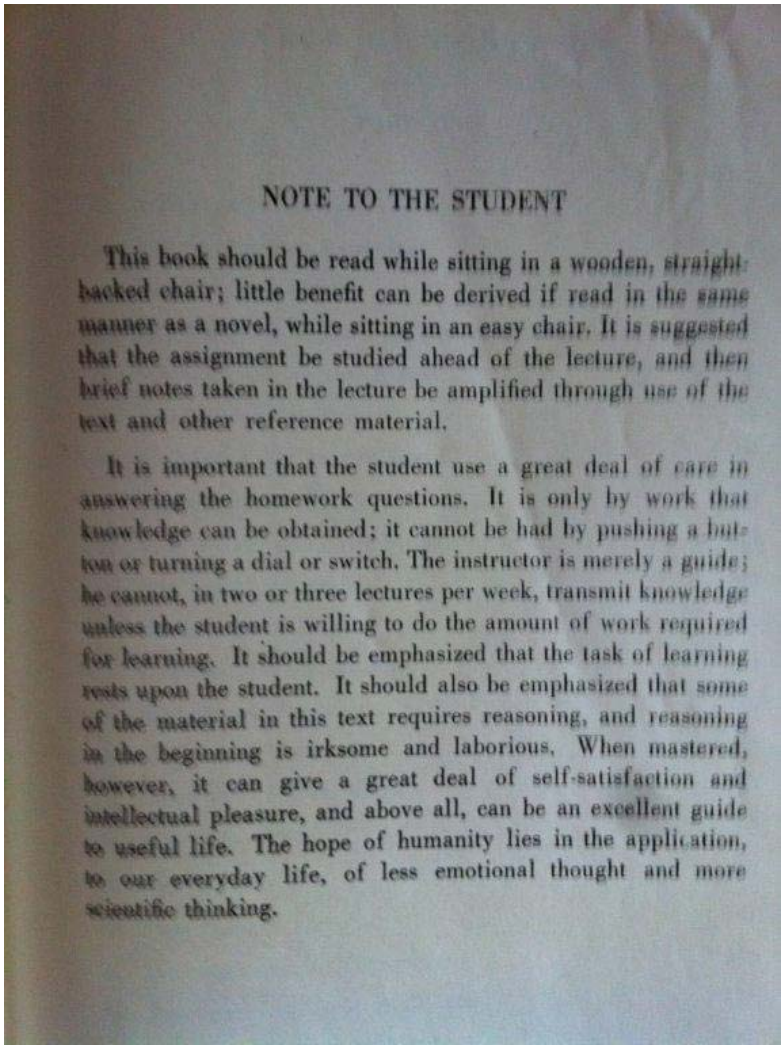
Topic #1

PSYCHOLOGY AND THE SCIENTIFIC METHOD

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



NOTE TO THE STUDENT

This book should be read while sitting in a wooden, straight-backed chair; little benefit can be derived if read in the same manner as a novel, while sitting in an easy chair. It is suggested that the assignment be studied ahead of the lecture, and then brief notes taken in the lecture be amplified through use of the text and other reference material.

It is important that the student use a great deal of care in answering the homework questions. It is only by work that knowledge can be obtained; it cannot be had by pushing a button or turning a dial or switch. The instructor is merely a guide; he cannot, in two or three lectures per week, transmit knowledge unless the student is willing to do the amount of work required for learning. It should be emphasized that the task of learning rests upon the student. It should also be emphasized that some of the material in this text requires reasoning, and reasoning in the beginning is irksome and laborious. When mastered, however, it can give a great deal of self-satisfaction and intellectual pleasure, and above all, can be an excellent guide to useful life. The hope of humanity lies in the application, to our everyday life, of less emotional thought and more scientific thinking.

Putnam, A. L., Sungkhasette, V. W., & Roediger, H. L. (2016). Optimizing learning in college: Tips from cognitive psychology. *Perspectives on Psychological Science, 11*, 652-660.

Table 1. Summary of Strategies for Optimizing Learning in College

Space out your learning.

- Study for a little bit every day, rather than cramming in one long session.
- Start studying early, and touch on each topic during each study session.
- Reading before class and reviewing lecture notes after class will help consolidate what was covered in class.

Learn more by testing yourself.

- Instead of writing a chapter summary as you read, write down what you remember after you read, recalling the details from memory. Then, check to see how well you did (the read-recite-review method).
- Answer the "end-of-chapter" questions both before and after you read a chapter.
- Use flash cards to learn key vocabulary. Retrieve the idea from memory (before looking at the answer) and use a larger (rather than a smaller) stack of cards. Put answers you missed back in the deck at an early place and the ones you got right at the end. Finally, aim to recall each item correctly multiple times before taking a card out of the deck.
- Be skeptical about what you think you know—testing yourself can provide a better picture about which concepts you know well and which you might need to study further.

Get the most out of your class sessions.

- Attend every class session.
- Stay focused during class by leaving your laptop at home; you'll avoid distracting yourself and your classmates, and you may remember more by taking notes by hand.
- Ask your professor for a copy of any PowerPoint slides before class, so that you can take notes directly on the slide handout.

Be an active reader.

- Instead of speeding through your reading, slow down and aim for understanding.
- Ask yourself questions as you read, such as, "What did I learn on this page?" and "What on this page is new to me?"
- Finally, write some of your own questions about tricky concepts: "What is an example of *X* in real life?" or "How is Theory *X* different from Theory *Z*?"

Other general tips.

- Get organized early in the semester: Put major due dates and exams on your calendar, set reminders to get start studying early, and be sure to look at your calendar at least once a week so you can plan ahead.
- Get some exercise. Going for a 50-min walk in nature can enhance your ability to focus on difficult tasks.
- Sleep! Sleeping is critical for ensuring that memories are successfully stored in long-term memory.

Psychological Science
2014, Vol. 25(6) 1159–1168

DOI: 10.1177/0956797614524581
pss.sagepub.com
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The Pen Is Mightier Than the Keyboard: Advantages of Longhand Over Laptop Note Taking

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Abstract
Taking notes on laptops rather than in longhand is increasingly common. Many researchers have suggested that laptop note taking is less effective than longhand note taking for learning. Prior studies have primarily focused on students' capacity for multitasking and distraction when using laptops. The present research suggests that even when laptops are used solely to take notes, they may still be impairing learning because their use results in shallower processing. In three studies, we found that students who took notes on laptops performed worse on conceptual questions than students who took notes longhand. We show that whereas taking more notes can be beneficial, laptop note takers' tendency to transcribe lectures verbatim rather than processing information and reframing it in their own words is detrimental to learning.

Economics of Education Review 56 (2017) 118–132

Contents lists available at ScienceDirect

Economics of Education Review

journal homepage: www.elsevier.com/locate/econedurev

The impact of computer usage on academic performance: Evidence from a randomized trial at the United States Military Academy☆

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ARTICLE INFO

Article history:
Received 5 July 2016
Revised 8 December 2016
Accepted 9 December 2016
Available online 14 December 2016

ABSTRACT

We present findings from a study that prohibited computer devices in randomly selected classrooms of an introductory economics course at the United States Military Academy. Average final exam scores among students assigned to classrooms that allowed computers were 0.18 standard deviations lower than exam scores of students in classrooms that prohibited computers. Through the use of two separate treatment arms, we uncover evidence that this negative effect occurs in classrooms where laptops and tablets are permitted without restriction and in classrooms where students are only permitted to use tablets that must remain flat on the desk.

Published by Elsevier Ltd.

Logged In and Zoned Out: How Laptop Internet Use Relates to Classroom Learning

Psychological Science
1–10
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sagepub.com/journalsPermissions.nav
DOI: 10.1177/0956797616677314
pss.sagepub.com
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Abstract

Laptop computers are widely prevalent in university classrooms. Although laptops are a valuable tool, they offer access to a distracting temptation: the Internet. In the study reported here, we assessed the relationship between classroom performance and actual Internet usage for academic and nonacademic purposes. Students who were enrolled in an introductory psychology course logged into a proxy server that monitored their online activity during class. Past research relied on self-report, but the current methodology objectively measured time, frequency, and browsing history of participants' Internet usage. In addition, we assessed whether intelligence, motivation, and interest in course material could account for the relationship between Internet use and performance. Our results showed that nonacademic Internet use was common among students who brought laptops to class and was inversely related to class performance. This relationship was upheld after we accounted for motivation, interest, and intelligence. Class-related Internet use was not associated with a benefit to classroom performance.

MY GOAL? => to get you to UNDERSTAND the material.

Understanding vs. Knowledge

"One understands a subject (issue, concept, theory, . . .) only if one grasps how a constellation of facts relevant to that subject are related to one another (causally, inferentially, explanatorily, etc.) in such a way as to be able to make new connections or draw new inferences with novel information. As a result, the object of understanding is always a body—and never a single piece—of information."

Besides its concordance with philosophy, this definition fits with what we know from psychology—understanding requires a greater level of explanatory depth than does knowledge. If someone understands, we expect that person to know more than an isolated fact, and to be able to deploy what they know to answer new questions.

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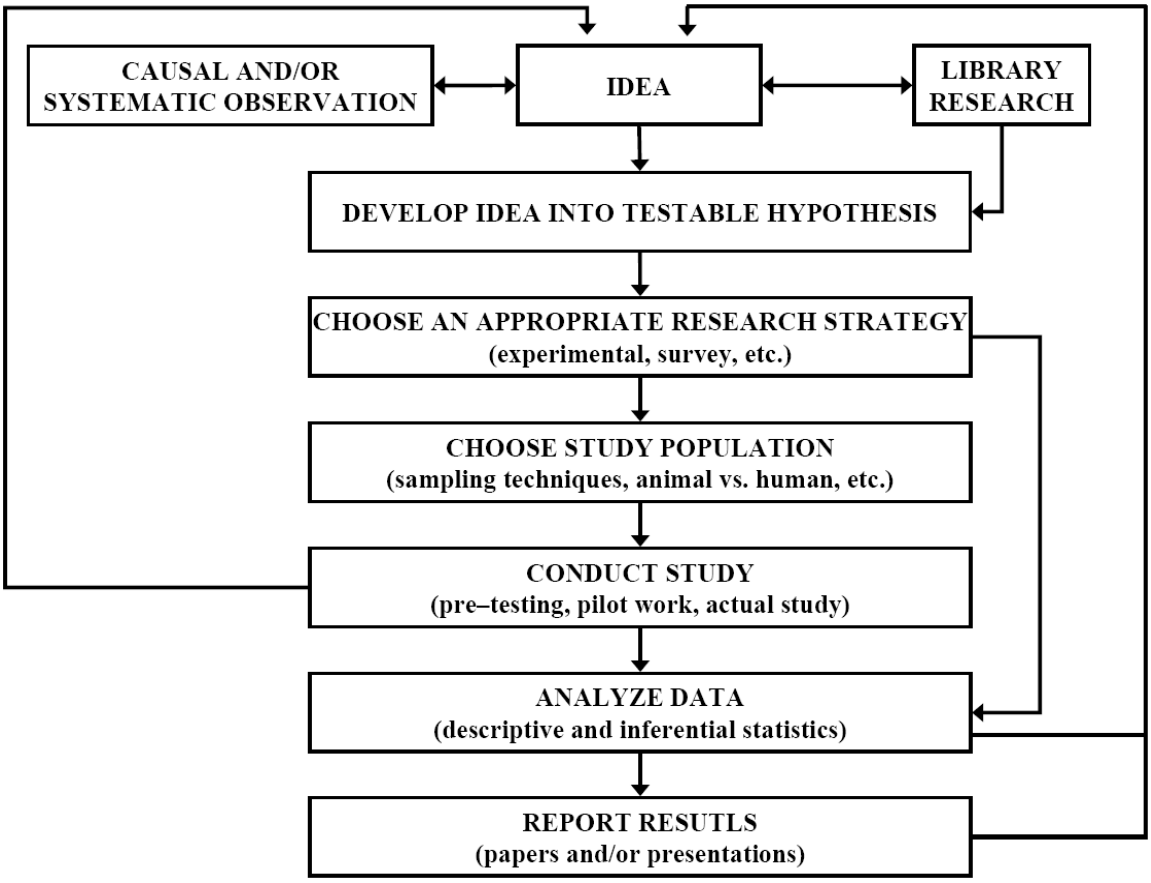
In summary, the focus of this course is on the development and assessment of psychological research designs and methods that are used to investigate issues or answer specified questions of interest. This focus can be distinguished from the other use of the term—experimental psychology—which represents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