

How to study, learn, and remember

Excerpts from Brown, P. C., Roediger, H. L., & McDaniel, M. A. (2014). *Make It Stick*. Harvard University Press.

► Learning Requires Effort

Embrace the fact that *significant learning is usually somewhat difficult*. You will experience setbacks. These are signs of effort, not of failure. Setbacks come with striving, and striving builds expertise. Effortful learning changes your brain, making new connections, building mental models, increasing your capability. The implication of this is powerful: Your intellectual abilities lie to a large degree within your own control. Knowing that this is so makes the difficulties worth tackling.

► Practice Retrieving New Learning from Memory

“Retrieval practice” means self-quizzing. Retrieving knowledge and skill from memory should become your primary study strategy in place of rereading. When you read a text or study lecture notes, pause periodically to ask yourself questions like these, without looking in the text: What are the key ideas? What terms or ideas are new to me? How would I define them? How do the ideas relate to what I already know? Set aside a little time every week throughout the semester to quiz yourself on the material in a course, both the current week’s work and material covered in prior weeks. When you quiz yourself, check your answers to make sure that your judgments of what you know and don’t know are accurate. The harder it is for you to recall new learning from memory, the greater the benefit of doing so. Making errors will not set you back, so long as you check your answers and correct your mistakes.

Rereading is easy but it doesn’t work well. Most students focus on underlining and highlighting text and lecture notes and slides. They dedicate their time to rereading these, becoming fluent in the text and terminology, because this feels like learning. The familiarity with a text that is gained from rereading creates illusions of knowing, but these are not reliable indicators of mastery of the material. Fluency with a text has two strikes against it: it is a misleading indicator of what you have learned, and it creates the false impression that you will remember the material. By contrast, quizzing helps you to focus on the central precepts rather than on peripheral material or on a professor’s turn of phrase. Quizzing provides a reliable measure of what you’ve learned and what you haven’t yet mastered. Moreover, quizzing arrests forgetting. Periodically practicing new knowledge and skills through self-quizzing strengthens your learning of it and your ability to connect it to prior knowledge. A habit of regular retrieval practice throughout the duration of a course puts an end to cramming and all-nighters.

Retrieval practice takes more effort but is worth it. Compared to rereading, self-quizzing can feel awkward and frustrating, especially when the new learning is hard to recall. It does not feel as productive as rereading your class notes and highlighted passages of text feels. But every time you work hard to recall a memory, you actually strengthen it. If you restudy something after failing to recall it, you actually learn it better than if you had not tried to recall it. The effort of retrieving knowledge or skills strengthens its staying power and your ability to recall it in the future.

► Space Out Your Retrieval Practice

Spaced practice means studying information more than once but leaving considerable time between practice sessions. Establish a schedule of self-quizzing that allows time to elapse between study sessions. How much time? It depends on the material. New material in a text may need to be revisited within a day or so of your first encounter with it. Then, perhaps not again for several days or a week. When you are feeling more sure of your mastery of certain material, quiz yourself on it once a month. Over the course of a semester, as you quiz yourself on new material, also reach back to retrieve prior material and ask yourself how that knowledge relates to what you have subsequently learned. If you use flashcards, don’t stop quizzing yourself on the cards that you answer correctly a couple of times. Continue to shuffle them into the deck until they’re well mastered. Only then set them aside—but in a pile that you revisit periodically, perhaps monthly. Anything you want to remember must be periodically recalled from memory.

Massed practice (cramming) doesn’t work. Intuition persuades us to dedicate stretches of time to single-minded, repetitive practice of something we want to master. These intuitions are compelling for two reasons. First, as we practice a thing over and over we often see our performance improving. Second, we fail to see that the gains made during single-minded repetitive practice come from short-term memory and quickly fade. Our failure to perceive how quickly the gains fade leaves us with the impression that massed practice is productive. Moreover, most students, given their misplaced faith in massed practice, put off review until exam time nears, and then they bury themselves in the material, going over and over it, trying to burn it into memory.

Cramming feels more productive but it isn’t. Spaced practice feels more difficult, because you have gotten a little rusty and the material is harder to recall. It feels like you’re not really getting on top of it, whereas in fact, quite the opposite is happening: As you reconstruct learning from long-term memory, as awkward as it feels, you are strengthening your mastery as well as the memory.

► Interleave Study of Different Problem Types

What does this mean? If you’re trying to learn mathematical formulas, study more than one type at a time, so that you are alternating between different problems that call for different solutions. If you are studying biology specimens, Dutch painters, or the principles of macroeconomics, mix up the examples.

PSY 222 Research Methods
Price (v 3.0) Chapter 2: Getting Started in Research

Learn about each key term/concept so that you are able to:

- Recall** the definition and examples.
- Perform** it if it is a skill or procedure.
- Identify and evaluate the accuracy** of new examples.
Look for **relationships** between concepts.
- Distinguish** between similar concepts.
- Create new examples** of the concept, if applicable.

Study reminders

- Use spaced retrieval practice
- Study–wait–test all–repeat
- Avoid simple rereading and cramming
- Practice what you will do on the exam

Key terms. Define each term and give examples (additional terms not in the textbook)**

Variable	Pearson's r	Professional journal
Quantitative variable	Nonlinear relationship	Empirical research report
Categorical variable	Independent variable	Review article
Operational definition	Dependent variable	Theoretical article
Bar graph	Directionality problem	Peer review
Cohen's d	Third-variable problem	Scholarly book
Scatterplot	Experiment	PsycINFO
Positive relationship	Feasibility	
Negative relationship	Research literature	

Practice writing answers to these questions as you would for an exam (≈ 80-100 words). When possible, illustrate abstract concepts with concrete examples.

1. Explain the difference between a population and a sample.
2. Describe two basic forms of statistical relationship and give examples of each.
3. Explain why correlation does not imply causation.
4. Describe some common sources of research ideas and generate research ideas using those sources.
5. Describe some techniques for turning research ideas into empirical research questions and use those techniques to generate questions.
6. Explain what makes a research question interesting and evaluate research questions in terms of their interestingness.
7. Give examples of (a) sources that are part of the psychology research literature and (b) sources that are not.
8. Describe and use several methods for finding previous research on a particular research idea or question.

Other required material

PSY 222 Research Methods
Price (v 3.0) Chapter 3: Research Ethics

Learn about each key term/concept so that you are able to:

Recall the definition and examples.

Perform it if it is a skill or procedure.

Identify and evaluate the accuracy of new examples.

Look for **relationships** between concepts.

Distinguish between similar concepts.

Create new examples of the concept, if applicable.

Study reminders

- Use spaced retrieval practice
- Study–wait–test all–repeat
- Avoid simple rereading and cramming
- Practice what you will do on the exam

Key terms. Define each term and give examples (additional terms not in the textbook)**

Ethics

Confederate

Autonomy

Informed consent

Privacy

Confidentiality

Federal Policy for the Protection of Human Subjects

Institutional review board (IRB)

Exempt research

Minimal risk research

At-risk research

Consent form

Deception

Debriefing

Protocol

Prescreening

Practice writing answers to these questions as you would for an exam (≈ 80-100 words). When possible, illustrate abstract concepts with concrete examples.

1. Describe a simple framework for thinking about ethical issues in psychological research.
2. Give examples of several ethical issues that arise in psychological research—including issues that affect (a) research participants, (b) the scientific community, and (b) society more generally.
3. Summarize the American Psychological Association Ethics Code—especially as it relates to informed consent, deception, debriefing, research with nonhuman animals, and scholarly integrity
4. Describe several strategies for identifying and minimizing risks and deception in psychological research.

Other required material

PSY 222 Research Methods

Price (v 3.0) Chapter 11: Presenting your research

Learn about each key term/concept so that you are able to:

Recall the definition and examples.

Perform it if it is a skill or procedure.

Identify and evaluate the accuracy of new examples.

Look for **relationships** between concepts.

Distinguish between similar concepts.

Create new examples of the concept, if applicable.

Study reminders

- Use spaced retrieval practice
- Study–wait–test all–repeat
- Avoid simple rereading and cramming
- Practice what you will do on the exam

Key terms. Define each term and give examples (** additional terms not in the textbook)

APA style	Abstract	Review article
APA Publication Manual	Introduction	Theoretical article
(APA) Organization	Opening	Professional conference
(APA) High-level style	Literature review	Oral presentation
(APA) Low-level style	Closing	Poster
Reference	Method section	Poster session
Reference citation	Results section	** p-value
Empirical research report	Discussion	** Bayes factor
Title page	Appendix	

Practice writing answers to these questions as you would for an exam (\approx 80-100 words). When possible, illustrate abstract concepts with concrete examples.

1. Define APA style and list several of its most important characteristics.
2. Identify three levels of APA style and give examples of each.
3. Identify multiple sources of information about APA style.
4. Identify the major sections of an APA style research report and the basic contents of each section.
5. List several ways that researchers in psychology can present their research and the situations in which they might use them.
6. Describe how "final" manuscripts differ from "copy" manuscripts in APA style.
7. Describe the purpose of talks and posters at professional conferences.