Learning science is a discipline that examines what practices and habits support effective and efficient studying. This field also works to identify fallacies that misguide our studying. Rather than relying on what we think works, or trying to learn according to our personal "style," there are evidence-based learning principles we can adopt to help make our learning most successful.

**What might be happening**

You may be relying too much on passive learning (reading, rereading, listening to podcasts, copying notes, etc.) in your studying. Passive learning feels responsible, but can lead to a false sense of knowing, if knowing means you can successfully generate information from memory. Exams come at a fast pace in the quarter system, and the path to mastery using mostly passive methods can be slow, even if you are putting in a lot of hours.

**What to do instead**

You should consider introducing more active learning to give yourself chances to generate, produce, construct, and apply your knowledge (called the production or generation effect). Examples can include drawing and talking through diagrams and concept maps, playing recall games (Quizlet or Kahoot), taking turns teaching and quizzing a friend, and doing practice problems (try using no notes!). One step further is to use a variety of methods in any one study session: transform your notes, play games on Quizlet, and then draw a concept map that relates the core topics of the lecture. Our brains love variety, and variety helps us retain information.

**What might be happening**

Does any of this sound familiar?

- You wait to take the practice exam until close to the actual exam date
- You complete it slowly, and carefully
- You complete part of it now, part of it later (not in one sitting)
- You pause to take a look at your notes
- You avoid making mistakes, and stop to look at the answer key as you go
- You focus on repairing the errors on the exam, but don't look outside the exam to find additional questions that test the same concept.

If this sounds like you, there are better ways to maximize practice exams!

**What to do instead**

Completing practice exams is a great way to engage in retrieval practice, or self-testing, which supports better remembering. However, the power of retrieving information is in the struggle. Notes need to go away, and mistakes will be made. What is the real exam like? It is (1) timed, (2) done in one sitting, and (3) completed (typically) without notes. If you rehearse how you need to perform, you are in a better position to maximize your score on the exam. Plan to take it early, as a diagnostic. Go to the library or an empty classroom, set a timer, and do it all in one sitting. Correct it afterwards with the key, and get curious about your errors. Decide what topics need more attention based on your errors, and review. Look for and complete additional questions that test those topics. Then, wait a few days, and retake the practice test. Did your score improve? If you aren’t provided practice exams, creating them counts as studying. Predict prompts and write out practice essays, compile and reorder homework questions, or generate a vocabulary quiz using Quizlet.

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### What might be happening

You might be chunking and compartmentalizing concepts by taking the content chapter by chapter, lecture by lecture, as you design your guide. Even if you are using an active strategy like self-testing, you may be inflating what you think you know due to the compartmentalizing. How so? Well, when you do one practice problem successfully, and then try and do another problem based on the same or similar topic, you have already primed or activated your knowledge and it is more available to you as you complete the second problem. This makes the second problem easier to do. This is great when we are first trying to reach a basic competency in a subject, but inflates what we think we know in the long term. This might cause us to overlook or understudy important concepts. Remember, exams typically randomize the order of questions and concepts.

### What to do instead

You should consider interleaving more in your studying, meaning reviewing old information alongside new information, which better contrasts conceptual differences. When you relate prior information to new information, you strengthen recall overall and more quickly grasp new content. When you combine three homework assignments together and randomize the order of the questions, you have created an interleaved quiz that will challenge your memory and help you build more agility in recalling information as you jump from a current concept, to one you learned weeks ago (that sounds like the exam!). Other techniques can include studying notes from the last lecture right before class that will present new information, mixing up stacks of flashcards that come from different chapters or lectures, and drawing a concept map that relates old and new concepts together. Additionally, study guides can encourage us to give the same priority to all content. Remember self-testing? Engaging in retrieval practice can help you prioritize. Quiz yourself and let your errors direct you to concepts that deserve extra attention.

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### What might be happening

You may decide a few weeks into the quarter that it is “time to start studying.” You are keeping up with the homework, maybe rereading your notes. However, it feels like you always run out of time to get through all the material on the midterm. Later when you prepare for the cumulative final, you feel like you can’t remember much of the content from the first weeks of class.

### What to do instead

Given the pace of the quarter system, it’s not enough to “start” studying; you should be consistently reviewing content weekly starting week 1. Study/review sessions should be blocked out on your calendar. Cramming causes stress and fatigue, affecting your cognitive performance on an exam happening in the near future, and it doesn’t set us up to retain information very successfully in the long-term. Instead of studying eight hours on a Sunday for an exam on Monday, try breaking that up into four two-hour sessions over the week. The smaller, more frequent study sessions are an example of distributed practice (spacing effect). With spaced out study sessions you increase your ability to remember the information over time. How can you insure your study sessions are distributed? A time blocked calendar (like Google Calendar) can help you to strategically stagger your study sessions. A good ratio is for every one hour of lecture, we need a 2-3 hours for study/review, beyond just completing the homework.

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