



# COLLEGE SUCCESS

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## Studying, Memory, and Test Taking



**Figure 6.1** How we study is as important as what we study. The environment is a critical element of success.

### Chapter Outline

- 6.1 Memory
- 6.2 Studying
- 6.3 Test Taking

### Introduction

#### Student Survey

How confident are you in preparing for and taking tests? Take this quick survey to figure it out, ranking questions on a scale of 1–4, 1 meaning “least like me” and 4 meaning “most like me.” These questions will help you determine how the chapter concepts relate to you right now. As you are introduced to new concepts and practices, it can be informative to reflect on how your understanding changes over time. We’ll revisit these questions at the end of the chapter to see whether your feelings have changed.

1. I set aside enough time to prepare for tests.
2. If I don’t set aside enough time, or if life gets in the way, I can usually cram and get positive results.
3. I prefer to pull all-nighters. The adrenaline and urgency help me remember what I need come test time.
4. I study my notes, highlight book passages, and use flash cards, but I still don’t feel like I’m as successful as I should be on tests.

You can also take the [Chapter 6 Survey \(https://openstax.org/l/collegesurvey06\)](https://openstax.org/l/collegesurvey06) anonymously online.

## STUDENT PROFILE

“I didn’t have to study much for tests in high school, but I learned really quick that you have to for college. One of the best strategies is to test yourself over the material. This will help you improve your retrieval strength and help you remember more when it comes to the test. I also learned about reviewing your graded tests. This will help you see where you went wrong and why. Being able to see your mistakes and correct them helps the storage and retrieval strength as well as building those dendrites. Getting a question wrong will only improve those things helping you remember the next time it comes up.”

—**Lilli Branstetter**, University of Central Arkansas

### About this Chapter

By the time you finish this chapter, you should be able to do the following:

- Outline the importance of memory when studying, and note some opportunities to strengthen memory.
- Discuss specific ways to increase the effectiveness of studying.
- Articulate test-taking strategies that minimize anxiety and maximize results.

Kerri didn’t need to study in high school. She made good grades, and her friends considered her lucky because she never seemed to sweat exams or cram. In reality, Kerri did her studying during school hours, took excellent notes in class, asked great questions, and read the material before class meetings—all of these are excellent strategies. Kerri just seemed to do them without much fuss.

Then when she got to college, those same skills weren’t always working as well. Sound familiar? She discovered that, for many classes, she needed to read paragraphs and textbook passages more than once for comprehension. Her notes from class sessions were longer and more involved—the subject material was more complicated and the problems more complex than she had ever encountered. College isn’t high school, as most students realize shortly after enrolling in a higher ed program. Some old study habits and test-taking strategies may serve as a good foundation, but others may need major modification.

It makes sense that, the better you are at studying and test taking, the better results you’ll see in the form of high grades and long-term learning and knowledge acquisition. And the more experience you have using your study and memorization skills and employing success strategies during exams, the better you’ll get at it. But you have to keep it up—maintaining these skills and learning better strategies as the content you study becomes increasingly complex is crucial to your success. Once you transition into a work environment, you will be able to use these same skills that helped you be successful in college as you face the problem-solving demands and expectations of your job. Earning high grades is one goal, and certainly a good one when you’re in college, but true learning means committing content to long-term memory.

## 6.1 Memory

Estimated completion time: 32 minutes.

### Questions to consider:

- How does working memory work, exactly?

- What’s the difference between working and short-term memory?
- How does long-term memory function?
- What obstacles exist to remembering?
- When and how should you memorize things?

In what situations is it best to memorize, and what do you memorize?

What can you do consistently to improve both your short- and long-term memory?

Memory is one of those cherished but mysterious elements in life. Everyone has memories, and some people are very good at rapid recall, which is an enviable skill for test takers. We know that we seem to lose the capacity to remember things as we age, and scientists continue to study how we remember some things but not others and what memory means, but we don’t know that much about memory, really.

Nelson Cowan is one researcher who is working to explain what we do know about memory. His article “What Are the Differences between Long-Term, Short-Term, and Working Memory?” breaks down the different types of memory and what happens when we recall thoughts and ideas. When we remember something, we actually do quite a lot of thinking.<sup>[1]</sup>

We go through three basic steps when we remember ideas or images: we encode, store, and retrieve that information. Encoding is how we first perceive information through our senses, such as when we smell a lovely flower or a putrid trash bin. Both make an impression on our minds through our sense of smell and probably our vision. Our brains encode, or label, this content in short-term memory in case we want to think about it again.

If the information is important and we have frequent exposure to it, the brain will store it for us in case we need to use it in the future in our aptly named long-term memory. Later, the brain will allow us to recall or retrieve that image, feeling, or information so we can do something with it. This is what we call remembering.



**Figure 6.2**

## ANALYSIS QUESTION

Take a few minutes to list ways you create memories on a daily basis. Do you think about how you make memories? Do you do anything that helps you keep track of your memories?

## Foundations of Memory

William Sumrall et al. in the *International Journal of Humanities and Social Science* explain the foundation of memory by noting: “Memory is a term applied to numerous biological devices by which living organisms acquire, retain, and make use of skills and knowledge. It is present in all forms of higher order animals. The most evolutionary forms of memory have taken place in human beings. Despite much research and exploration, a complete understanding of human memory does not exist.”<sup>[2]</sup>

1 NCBI. “What are the differences between long-term, short-term, and working memory?” <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2657600/>

2 Sumrall, William, et. al. “A Review of Memory Theory.” *International Journal of Humanities and Social Science*, 2016. Vol. 6. No. 5.

## Working Memory

Working memory is a type of short-term memory, but we use it when we are actively performing a task. For example, nursing student Marilyn needs to use her knowledge of chemical reactions to suggest appropriate prescriptions in various medical case studies. She does not have to recall every single fact she learned in years of chemistry classes, but she does need to have a working memory of certain chemicals and how they work with others. To ensure she can make these connections, Marilyn will have to review and study the relevant chemical details for the types of drug interactions she will recommend in the case studies.

In working memory, you have access to whatever information you have stored in your memory that helps you complete the task you are performing. For instance, when you begin to study an assignment, you certainly need to read the directions, but you must also remember that in class your professor reduced the number of problem sets the written instructions indicated you needed to finish. This was an oral addition to the written assignment. The change to the instructions is what you bring up in working memory when you complete the assignment.

## Short-Term Memory

Short-term memory is a very handy thing. It helps us remember where we set our keys or where we left off on a project the day before. Think about all the aids we employ to help us with short-term memory: you may hang your keys in a particular place each evening so you know exactly where they are supposed to be. When you go grocery shopping, do you ever choose a product because you recall an advertising jingle? You see the box of cereal and you remember the song on the TV commercial. If that memory causes you to buy that product, the advertising worked. We help our memory along all the time, which is perfectly fine. In fact, we can modify these everyday examples of memory assistance for purposes of studying and test taking. The key is deliberate use of strategies that are not so elaborate that they are too difficult to remember in our short-term memory.

### ACTIVITY



Consider this list of items. Look at the list for no more than 30 seconds. Then, cover up the list and use the spaces below to complete an activity.

Baseball	Picture frame	Tissue	Paper clip
Bread	Pair of dice	Fingernail polish	Spoon
Marble	Leaf	Doll	Scissors
Cup	Jar of sand	Deck of cards	Ring
Blanket	Ice	Marker	String

Without looking at the list, write down as many items as you can remember.

Now, look back at your list and make sure that you give yourself credit for any that you got right. Any items that you misremembered, meaning they were not in the original list, you won't count in your total. TOTAL ITEMS REMEMBERED \_\_\_\_\_.

There were 20 total items. Did you remember between 5 and 9 items? If you did, then you have a typical short-term memory and you just participated in an experiment, of sorts, to prove it.

Harvard psychology professor George A. Miller in 1956 claimed humans can recall about five to nine bits of information in our short-term memory at any given time. Other research has come after this claim, but this concept is a popular one. Miller's article is entitled "The Magical Number Seven, Plus or Minus Two" and is easily accessible online if you're interested in learning more about this seminar report.<sup>[3]</sup>

Considering the vast amount of knowledge available to us, five to nine bits isn't very much to work with. To combat this limitation, we clump information together, making connections to help us stretch our capacity to remember. Many factors play into how much we can remember and how we do it, including the subject matter, how familiar we are with the ideas, and how interested we are in the topic, but we certainly cannot remember absolutely everything, for a test or any other task we face. As such, we have to use effective strategies, like those we cover later in this chapter, to get the most out of our memories.

## ACTIVITY



Now, let's revisit the items above. Go back to them and see if you can organize them in a way that you would have about five groups of items. See below for an example of how to group them.

Row 1: Items found in a kitchen

Row 2: Items that a child would play with

Row 3: Items of nature

Row 4: Items in a desk drawer/school supplies

Row 5: Items found in a bedroom

Cup	Spoon	Ice	Bread	
Baseball	Marble	Pair of dice	Doll	Deck of cards
Jar of sand	Leaf			
Marker	String	Scissors	Paper clip	
Ring	Picture frame	Fingernail polish	Tissue	Blanket

3 Miller, George A. "The Magical Number Seven, Plus or Minus Two: Some Limits on Our capacity for Processing Information." Psychological Review, 1956.

Now that you have grouped items into categories, also known as chunking, you can work on remembering the categories and the items that fit into those categories, which will result in remembering more items. Check it out below by covering up the list of items again and writing down what you can remember.

Now, look back at your list and make sure that you give yourself credit for any that you got right. Any items that you misremembered, meaning they were not in the original list, you won't count in your total. TOTAL ITEMS REMEMBERED \_\_\_\_\_. Did you increase how many items you could remember?

## Long-Term Memory

Long-term memory is exactly what it sounds like. These are things you recall from the past, such as the smell of your elementary school cafeteria or how to pop a wheelie on a bicycle. Our brain keeps a vast array of information, images, and sensory experiences in long-term memory. Whatever it is we are trying to keep in our memories, whether a beautiful song or a list of chemistry vocabulary terms, must first come into our brains in short-term memory. If we want these fleeting ideas to transfer into long-term memory, we have to do some work, such as causing frequent exposure to the information over time (such as studying the terms every day for a period of time or the repetition you performed to memorize multiplication tables or spelling rules) and some relevant manipulation for the information.

According to Alison Preston of the University of Texas at Austin's Center for Learning and Memory, "A short-term memory's conversion to a long-term memory requires changes within the brain . . . and result[s] in changes to neurons (nerve cells) or sets of neurons. . . . For example, new synapses—the connections between neurons through which they exchange information—can form to allow for communication between new networks of neurons. Alternatively, existing synapses can be strengthened to allow for increased sensitivity in the communication between two neurons."<sup>[4]</sup>

When you work to convert your thoughts into memories, you are literally *changing your mind*. Much of this brain work begins in the part of the brain called the *hippocampus*. Preston continues, "Initially, the hippocampus works in concert with sensory-processing regions distributed in the neocortex (the outermost layer of the brain) to form the new memories. Within the neocortex, representations of the elements that constitute an event in our life are distributed across multiple brain regions according to their content. . . . When a memory is first formed, the hippocampus rapidly combines this distributed information into a single memory, thus acting as an index of representations in the sensory-processing regions. As time passes, cellular and molecular changes allow for the strengthening of direct connections among the neocortical regions, enabling access to the memory independent of the hippocampus."

We learn the lyrics of a favorite song by singing and/or playing the song over and over. That alone may not be enough to get that song into the coveted long-term memory area of our brain, but if we have an emotional connection to the song, such as a painful breakup or a life-changing proposal that occurred while we were listening to the song, this may help. Think of ways to make your study session memorable and create connections with the information you need to study. That way, you have a better chance of keeping your study material in your memory so you can access it whenever you need it.

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4 Preston, Alison. "Ask the Experts: How do short-term memories become long-term memories?" *Scientific American*, Dec. 2017. <https://www.scientificamerican.com/article/how-do-short-term-memories-become-l/>

## ANALYSIS QUESTION

What are some ways you convert short-term memories into long-term memories?

Do your memorization strategies differ for specific courses (e.g., how you remember for math or history)?

## Obstacles to Remembering

If remembering things we need to know for exams or for learning new disciplines were easy, no one would have problems with it, but students face several significant obstacles to remembering, including a persistent lack of sleep and an unrealistic reliance on cramming. Life is busy and stressful for all students, so you have to keep practicing strategies to help you study and remember successfully, but you also must be mindful of obstacles to remembering.

### Lack of Sleep

Let's face it, sleep and college don't always go well together. You have so much to do! All that reading, all those papers, all those extra hours in the science lab or tutoring center or library! And then we have the social and emotional aspects of going to school, which may not be the most critical aspect of your life as you pursue more education but are a significant part of who you are. When you consider everything you need to attend to in college, you probably won't be surprised that sleep is often the first thing we give up as we search for more time to accomplish everything we're trying to do. That seems reasonable—just wake up an hour earlier or stay up a little later. But you may want to reconsider picking away at your precious sleep time.

Sleep benefits all of your bodily functions, and your brain needs sleep time to dream and rest through the night. You probably can recall times when you had to do something without adequate sleep. We say things like "I just can't wake up" and "I'm walking around half asleep."

In fact, you may actually be doing just that. Lack of sleep impairs judgment, focus, and our overall mood. Do you know anyone who is always grumpy in the morning? A fascinating medical study from the University of California Los Angeles (UCLA) claims that sleep deprivation is as dangerous as being drunk, both in what it does to our bodies and in the harm we may cause to ourselves and others in driving and performing various daily tasks.<sup>[5][6]</sup>

If you can't focus well because you didn't get enough sleep, then you likely won't be able to remember whatever it is you need to recall for any sort of studying or test-taking situation. Most exams in a college setting go beyond simple memorization, but you still have a lot to remember for exams. For example, when Saanvi sits down to take an exam on introductory biology, she needs to recall all the subject-specific vocabulary she read in the textbook's opening chapters, the general connections she made between biological studies and other scientific fields, and any biology details introduced in the unit for which she is taking the exam.

5 Nir, Yuval, et. al. "Selective neuronal lapses precede human cognitive lapses following sleep deprivation," *Nature Medicine* volume23, pages 1474–1480 (2017).

6 UCLA Health. "Drowsy Driving." <https://www.uclahealth.org/sleepcenter/drowsy-driving>

Trying to make these mental connections on too little sleep will take a large mental toll because Saanvi has to concentrate even harder than she would with adequate sleep. She isn't merely tired; her brain is not refreshed and primed to conduct difficult tasks. Although not an exact comparison, think about when you overtax a computer by opening too many programs simultaneously. Sometimes the programs are sluggish or slow to respond, making it difficult to work efficiently; sometimes the computer shuts down completely and you have to reboot the entire system. Your body is a bit like that on too little sleep.

On the flip side, though, your brain on adequate sleep is amazing, and sleep can actually assist you in making connections, remembering difficult concepts, and studying for exams. The exact reasons for this is still a serious research project for scientists, but the results all point to a solid connection between sleep and cognitive performance.

If you're interested in learning more about this research, the American Academy of Sleep Medicine (AASM) is a good place to start. One article is entitled "College Students: Getting Enough Sleep Is Vital to Academic Success."

## ANALYSIS QUESTION

How long do you sleep every night on average? Do you see a change in your ability to function when you haven't had enough sleep? What could you do to limit the number of nights with too little sleep?

## Downside of Cramming

At least once in their college careers, most students will experience the well-known pastime called *cramming*. See if any of this is familiar: Shelley has lots of classes, works part-time at a popular restaurant, and is just amazingly busy, so she puts off serious study sessions day after day. She isn't worried because she has set aside time she would have spent sleeping to cram just before the exam. That's the idea anyway. Originally, she planned to stay up a little late and study for four hours from 10 p.m. to 2 a.m. and still get several hours of refreshing sleep. But it's Dolphin Week or Beat State Day or whatever else comes up, and her study session doesn't start until midnight—she'll pull an *all-nighter* (to be more precise, this is actually an *all-really-early-morning-er*, but it doesn't quite have the same ring to it). So, two hours after her original start time, she tries to *cram* all the lessons, problems, and information from the last two weeks of lessons into this one session. Shelley falls asleep around 3 a.m. with her notes and books still on her bed. After her late night, she doesn't sleep well and goes into the morning exam tired.

Shelley does OK but not great on the exam, and she is not pleased with her results. More and more research is showing that the stress Shelley has put on her body doing this, combined with the way our brains work, makes cramming a seriously poor choice for learning.

One sleep researcher, Dr. Susan Redline from Boston, says, "Sleep deficiency can affect mood and the ability to make memories and learn, but it also affects metabolism, appetite, blood pressure, levels of inflammation in the body and perhaps even the immune response."<sup>[7]</sup>

Your brain simply refuses to cooperate with cramming—it sounds like a good idea, but it doesn't work.

7 Redline, Susan <https://abcnews.go.com/Health/Sleep/health-hazards-linked-lack-sleep/story?id=16524313>

Cramming causes stress, which can lead to paralyzing test anxiety; it erroneously supposes you can remember and understand something fully after only minimal exposure; and it overloads your brain, which, however amazing it is, can only focus on one concept at a time and a limited number of concepts all together for learning and retention.

Leading neuroscientist John Medina claims that the brain begins to wander at about 10 minutes, at which point you need a new stimulus to spark interest.<sup>[8]</sup> That doesn't mean you can't focus for longer than 10 minutes; you just have to switch gears a lot to keep your brain engaged. Have you ever heard a speaker drone on about one concept for, say, 30 minutes without somehow changing pace to engage the listeners? It doesn't take much to re-engage—pausing to ask the listeners questions or moving to a different location in the room will do it—but without these subtle attention markers, listeners start thinking of something else. The same thing happens to you if you try to cram all reading, problem-solving, and note reviewing into one long session; your brain will wander.

## WHAT STUDENTS SAY



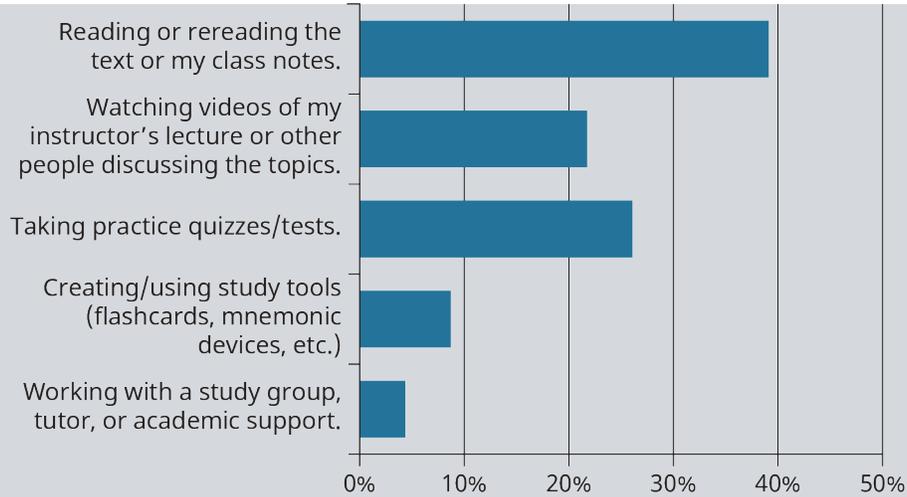
1. Which of the following is your most common method of studying?
  - a. Reading or rereading the text or my class notes.
  - b. Watching videos of my instructor's lecture or other people discussing the topics.
  - c. Taking practice quizzes/tests.
  - d. Creating/using study tools (flashcards, mnemonic devices, etc.)
  - e. Working with a study group, tutor, or academic support.
2. Which of the following do you have the most difficulty remembering?
  - a. Vocabulary and facts (such as Biology vocab, Historical facts.)
  - b. Problem-solving methods (such as in Math)
  - c. Details from text and literature
  - d. Skills and processes (such as a lab technique or a building process)
  - e. Computer functions/locations/processes
  - f. Which formulas, processes, or categories to apply in situations (such as in Physics or Accounting)
3. How much anxiety do you feel when an exam or other major course evaluation is approaching?
  - a. A great deal
  - b. A lot
  - c. A moderate amount
  - d. A little
  - e. None at all

You can also take the anonymous What [Students Say \(https://openstax.org/l/collegesurvey6-12\)](https://openstax.org/l/collegesurvey6-12) surveys to add your voice to this textbook. Your responses will be included in updates.

Students offered their views on these questions, and the results are displayed in the graphs below.

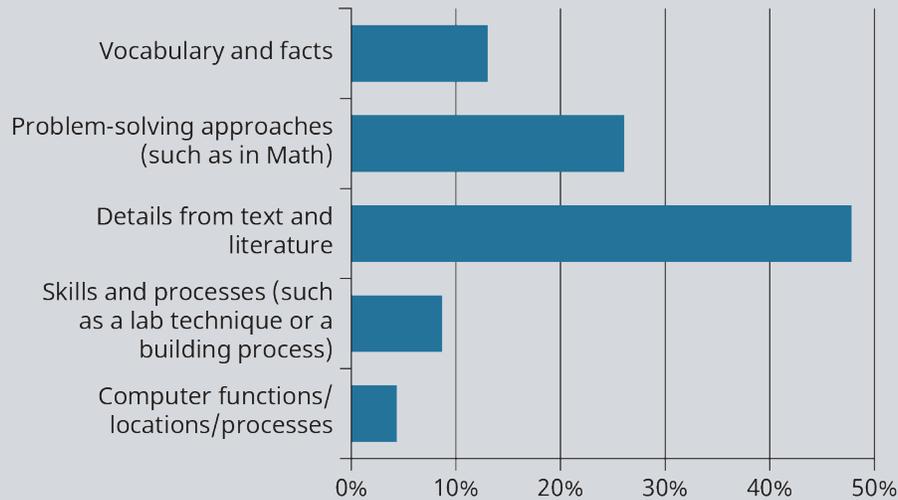
Which of the following is your most common method of studying?

8 Medina, John. Brain Rules. 2018, Pear Press.



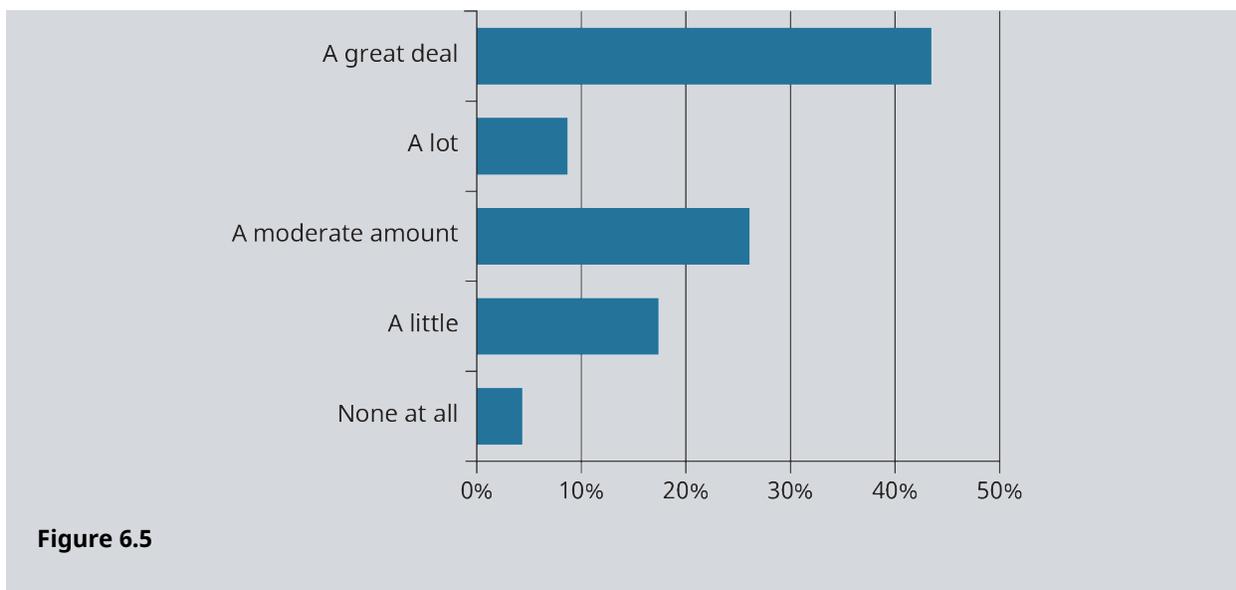
**Figure 6.3**

Which of the following do you have the most difficulty remembering?



**Figure 6.4**

How much anxiety do you feel when an exam or other major course evaluation is approaching?



## Determining When/What to Memorize

In the realm of learning and studying, some conditions warrant memorization as the most effective way to work with information. For instance, if you are expected to have a working knowledge of conversational French or Spanish, you will have to memorize some words. Simply knowing a long list of terms isn't going to help you order food in a café or ask for directions in a foreign country because you also need to understand the other language's grammar and have some sort of context for what needs to be said from your vocabulary list. But you cannot say the words in a different language if you cannot remember your vocabulary. From this scenario, you can assume that memorization is a good fit for some parts of language acquisition.

A worthwhile book on memory, thinking, and learning is a short study called *Make It Stick: The Science of Successful Learning* by Peter Brown, Henry Roediger, and Mark McDaniel. The authors conclude, after extensive research, that our attempts to speed up learning and make studying easier are not good ideas. Studying is hard work, and it should be. For learning to *stick*, we need to work hard to pull the information out of our memory and use it by continually pushing ourselves to accomplish increasingly difficult tasks.<sup>[9]</sup>

### 6.2 Studying

Estimated completion time: 27 minutes.

#### Questions to consider:

- How do you prepare yourself and your environment for successful studying?
- What study strategies will be most beneficial to you?
- What are learning preferences and strategies, and how can you leverage those to your advantage?

9 Brown, Peter, et. al. *Make It Stick: The Science of Successful Learning*. Brown, Roediger, Daniel, 2014.

## Preparing to Study

Studying is hard work, but you can still learn some techniques to help you be a more effective learner. Two major and interrelated techniques involve avoiding distractions to the best of your ability and creating a study environment that works to help you concentrate.

### Avoiding Distractions

We have always had distractions—video games, television shows, movies, music, friends—even housecleaning can distract us from doing something else we need to do, like study for an exam. That may seem extreme, but sometimes vacuuming is the preferred activity to buckling down and working through calculus problems! Cell phones, tablets, and portable computers that literally bring a world of possibilities to us anywhere have brought *distraction* to an entirely new level. When was the last time you were with a large group of people when you didn't see at least a few people on devices?



**Figure 6.6** Video games are a common distraction, but we need to be aware that even tedious activities like cleaning can be a distraction from studying.

When you study, your biggest challenge may be to block out all the competing noise. And letting go of that connection to our friends and the larger world, even for a short amount of time, can be difficult. Perhaps the least stressful way to allow yourself a distraction-free environment is to make the study session a definite amount of time: long enough to get a significant amount of studying accomplished but short enough to hold your attention.

You can increase that attention time with practice and focus. Pretend it is a professional appointment or meeting during which you cannot check e-mail or texts or otherwise engage with your portable devices. We have all become very attached to the ability to check in—anonously on social media or with family and friends via text, chat, and calls. If you set a specific amount of time to study without interruptions, you can convince your wandering mind that you will soon be able to return to your link to the outside world. Start small and set an alarm—a 30-minute period to review notes, then a brief break, then another 45-minute study session to quiz yourself on the material, and so on.

When you prepare for your optimal study session, remember to do these things:

- Put your phone out of sight—in another room or at least some place where you will not see or hear it

vibrate or ring. Just flipping it over is not enough.

- Turn off the television or music (more on that in the next section).
- Unless you are deliberately working with a study group, study somewhere alone if possible or at least away from others enough to not hear them talking.

If you live with lots of other people or don't have access to much privacy, see if you can negotiate some space alone to study. Ask others to leave one part of the house or an area in one room as a quiet zone during certain hours. Ask politely for a specific block of time; most people will respect your educational goals and be willing to accommodate you. If you're trying to work out quiet zones with small children in the house, the bathtub with a pillow can make a fine study oasis.

## Study Environment

You may not always be in the mood or inspired to study. And if you have a long deadline, maybe you can blow off a study session on occasion, but you shouldn't get into the habit of ignoring a strong study routine. Jane Austen once wrote in a letter, "I am not at all in a humor for writing; I must write on till I am." Sometimes just starting is the hard part; go ahead and begin. Don't wait around for your study muse; start working, and she'll show up.

Sometimes you just need to plop down and study whenever and wherever you can manage—in the car waiting for someone, on the bus, at the Little League field as you cheer on your shortstop. And that's OK if this is the exception. For long-term success in studying, though, you need a better study setting that will help you get the most out of your limited study time. Whatever your space limitations, carve out a place that you can dedicate to reading, writing, note taking, and reviewing. This doesn't need to be elaborate and expensive—all you truly need is a flat surface large enough to hold either your computer or writing paper, book or notes, pens/pencils/markers, and subject-specific materials you may need (e.g., stand-alone calculators, drawing tools, and notepads). Your space should be cool or warm enough for you to be comfortable as you study. What do you have now that you consider your study space? Is it set up for your optimal success?



**Figure 6.7** Which is before, and which is after? (Credit: Ali West / Flickr / Attribution 2.0 Generic (CC-BY 2.0))

If it is at all possible, try to make this area exclusive to your study sessions and something you can leave set up all the time and a place out of the way of family or roommate traffic. For example, Martina thought setting up her study station on the dining room table was a good idea at first. The view was calming, and the table was big enough to spread out and could even hold all her materials to study architectural drawings, her favorite subject. But then she needed the table for a small family dinner party, so she had to find a cubbyhole to hide away her supplies with some needing to go into a closet in the next room. Now she was spread out over multiple study spaces. And the family TV was in an adjacent room, not visible from the table but certainly an auditory distraction. Martina ultimately decided to forgo her view and create a smaller station in an unused

bedroom so she could leave her supplies out and have a quieter area. You may have to try out numerous places to determine what works best for you.

Wherever you study, try to make it a welcoming place you want to be in—not an uncomfortable environment that makes you want to just do the minimum you must complete and leave. You should include the basics: a good chair, a work surface, and whatever materials, books, notes, and other supplies you need for the subject you are studying. If you want to make it even more of a productive place, you can look in magazines for ideas or search the web to see how others have set up simple areas or more elaborate arrangements. Don't let decorating your workspace be an excuse to get out of studying!

You don't need an elaborate setting, but you may want to consider including a few effective additions if you have the space:

- small bulletin board for often-used formulas
- encouraging quotes or pictures of your goal
- whiteboard for brainstorming
- sticky notes for reminders in texts and notes
- file holder for most-used documents
- bookshelf for reference books

## ACTIVITY



Describe every element in your ideal study environment and explain why it's there as well as how it will make more efficient use of your time, limit distractions, or in some other way strengthen your ability to study.

After you have described your ideal study environment, think about how you can adapt that environment if you cannot be in your favorite place to study. How do you *make your own space* in the library, a student lounge, or a dedicated space on campus for student studying?

## Debunking Study Myths

### **MYTH #1: You can multitask while studying.**

How many times do you eat in the car? Watch TV while you write out a grocery list? Listen to music while you cook dinner? What about type an e-mail while you're on the phone with someone else and jot down notes about the call? The common term for this attempt to do more than one thing at a time is multitasking, and almost everyone does it at some point. On some days, you simply cannot accomplish all that you want to get done, so you double up. The problem is, multitasking doesn't really work. Of course, it exists, and we do it. For instance, we walk and chew gum or drive and talk, but we are not really thinking about two or more distinct things or doing multiple processes simultaneously.

### **MYTH #2: Highlighting main points of a text is useful.**

Another myth of studying that seems to have a firm hold is that the idea of highlighting text—in and of itself—is the best way to review study material. It is one way, and you can get some benefit from it, but don't trick yourself into spending too much time on this surface activity and consider your study session complete.

Annotating texts or notes is a first-step type of study practice. If you allow it to take up all your time, you may want to think you are fully prepared for an exam because you put in the time. Actually, you need much more time reviewing and retrieving your lessons and ideas from the text or class lecture as well as quizzing yourself to accomplish your goal of learning so you can perform well on the exam. Highlighting is a task you can do rather easily, and it makes you feel good because you are actively engaging with your text, but true learning needs more steps.

### **MYTH #3: Studying effectively is effortless.**

There is nothing effortless, or even pleasant at times, about studying. This is why so many students don't put in the time necessary to learn complex material: it takes time, effort, and, in some cases, a little drudgery. This is not to say that the outcome, learning—and maybe making an A—is not pleasant and rewarding. It is just that when done right, learning takes focus, deliberate strategies, and time. Think about a superstar athlete who puts in countless hours of drills and conditioning so that she makes her work on the field look easy. If you can also *enjoy* the studying, the skill development, and the knowledge building, then you will most likely be more motivated to do the work.

## ANALYSIS QUESTION

When are you most liable to multitask? How could you be more aware of this practice and try to eliminate it, especially when it comes to studying? How can you make your initial text highlighting more time efficient so you can include other study practices?

## Study Strategies

Everyone wishes they had a better memory or a stronger way to use memorization. You can make the most of the memory you have by making some conscious decisions about how you study and prepare for exams. Incorporate these ideas into your study sessions:

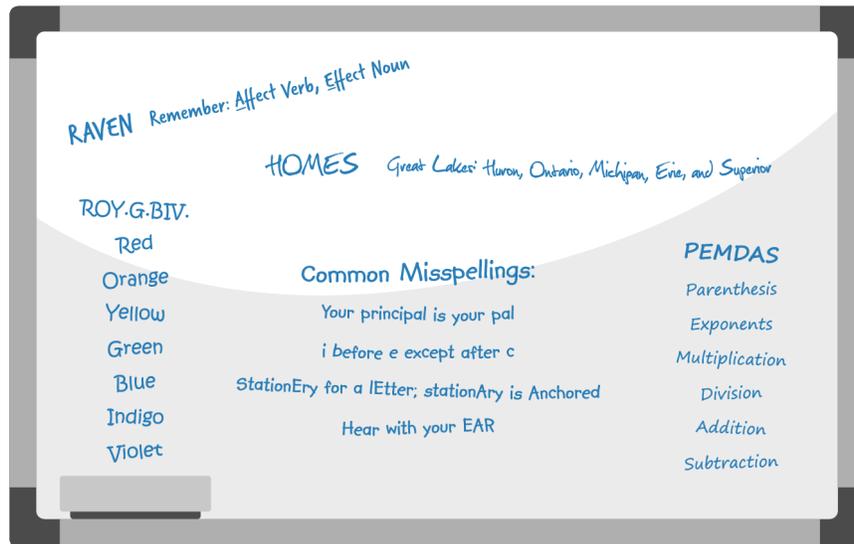
Practicing effective memorization is when you use a trick, technique, or strategy to recall something—for another class, an exam, or even to bring up an acquaintance's name in a social situation. Really whatever works for you to recall information is a good tool to have. You can create your own quizzes and tests to go over material from class. You can use mnemonics to jog your memory. You can work in groups to develop unique ways to remember complex information. Whatever methods you choose to enhance your memory, keep in mind that repetition is one of the most effective tools in any memory strategy. Do whatever you do over and over for the best results.

### Using Mnemonics

Mnemonics (pronounced new-monics) are a way to remember things using reminders. Did you learn the points of the compass by remembering NEWS (north, east, west, and south)? Or the notes on the music staff as FACE or EGBDF (every good boy does fine)? These are mnemonics. When you're first learning something and you aren't familiar with the foundational concepts, these help you bring up the information quickly, especially for multistep processes or lists. After you've worked in that discipline for a while, you likely don't

need the mnemonics, but you probably won't forget them either.

Here are some familiar mnemonics you may find useful:



**Figure 6.8**

You can certainly make up your own mnemonics, but be careful that your reminder isn't so complex and convoluted that it is more difficult to remember than the information you were relating it to!

## ANALYSIS QUESTION

Do you have other mnemonics that help you remember difficult material? What are they? How have they helped you with remembering important things?

## Practicing Concept Association

When you study, you're going to make connections to other things—that's a good thing. It shows a highly intelligent ability to make sense of the world when you can associate like and even somewhat unlike components. If, for instance, you were reading Martin Luther King Jr.'s "Letter from a Birmingham Jail," and you read the line that he had been in Birmingham, you may remember a trip you took with your family last summer through Alabama and that you passed by and visited the civil rights museum in Birmingham. This may remind you of the different displays you saw and the discussions you had with your family about what had happened concerning civil rights in the 1950s, '60s, and '70s in the United States.

This is a good connection to make, but if your assignment is to critique the literary aspects of King's long epistle, you need to be able to come back to the actual words of the letter and see what trends you can see in his writing and why he may have used his actual words to convey the powerful message. The connection is fine, but you can't get lost in going down rabbit holes that may or may not be what you're supposed to be doing at the time. Make a folder for this assignment where you can put things such as a short summary of

your trip to Alabama. You may eventually include notes from this summary in your analysis. You may include something from a website that shows you information about that time period. Additionally, you could include items about Martin Luther King Jr.'s life and death and his work for civil rights. All of these elements may help you understand the significance of this one letter, but you need to be cognizant of what you're doing at the time and remember it is not usually a good idea to just try to keep it all in your head. The best idea is to have a way to access this information easily, either electronically or in hard copy, so that if you are able to use it, you can find it easily and quickly.

## Generating Idea Clusters

Like mnemonics, idea clusters are nothing more than ways to help your brain come up with ways to recall specific information by connecting it to other knowledge you already have. For example, Andrea is an avid knitter and remembers how to create complicated stitches by associating them with nursery rhymes she read as a child. A delicate stitch that requires concentration because it makes the yarn look like part of it is hiding brings to mind Red Riding Hood, and connecting it to that character helps Andrea recall the exact order of steps necessary to execute the design. You can do the same thing with song lyrics, lines from movies, or favorite stories where you draw a connection to the well-known phrase or song and the task you need to complete.

### APPLICATION



Choose one of the following, and create an idea cluster to group and organize:

- Example A: aviation jobs in North America
- Example B: the use of analytics in sports to determine team rosters
- Example C: how social media affects political campaigns

Start the idea cluster with the topic circled in the middle of the page. For Example A, you might make one cluster off the main circle for specific positions; you could add another cluster for salary ranges and another for geographic regions.

## Three Effective Study Strategies

There are more than three study strategies, but focusing on the most effective strategies will make an enormous difference in how well you will be able to demonstrate learning (also known as “acing your tests”). Here is a brief overview of each of the three strategies:

- Spacing—This has to do with *when* you study. Hint: Don't cram; study over a period of days, preferably with “breaks” in between.
- Interleaving—This has to do with *what* you study. Hint: Don't study just one type of content, topic, chapter, or unit at a time; instead, mix up the content when you study.
- Practice testing—This has to do with *how* you study. Hint: Don't just reread content. You must quiz or test your ability to retrieve the information from your brain.

## Spacing

We all know that cramming is not an effective study strategy, but do we know why? Research on memory suggests that giving yourself time in between study sessions actually helps you forget the information. And forgetting, which sounds like it would be something you *don't* want to do, is actually good for your ability to remember information long-term. That's because every time you forget something, you need to relearn it, leading to gains in your overall understanding and "storage" of the material. The table below demonstrates how spacing works. Assume you are going to spend about four hours studying for a Sociology exam. Cramming would have you spending most of those four hours the night before the exam. With spacing, on the other hand, you would study a little bit each day.

Spacing

	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Cramming				Study for 1 hour	Study for 3 hours	<b>Sociology Test</b>	
Spacing	Study for 1 hour		Study for 30 minutes	Study for 1 hour	Study for 90 minutes	<b>Sociology Test</b>	

**Table 6.1**

## Interleaving

One particular studying technique is called interleaving, which calls for students to mix up the content that is being studied. This means not just spending the entire study session on one sort of problem and then moving on to a different sort of problem at a later time.

If you take the schedule we used for the spacing example above, we can add the interleaving concepts to it. Notice that interleaving includes revisiting material from a previous chapter or unit or revisiting different types of problems or question sets. The benefit is that your brain is "mixing up" the information, which can sometimes lead to short-term forgetting but can lead to long-term memory and learning.

## Interleaving

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday
Reread Sociology, Chapter 1. Reorganize notes		Reread Sociology, Chapter 1 and 2 Take Ch 1 online quiz. Create Chapter 2 concept map	Reread Sociology, Chapters 1-3. Take online quizzes for chapters 2 and 3. Reorganize notes. Create practice test	Reread notes. Review items missed on online quizzes. Take practice test and review challenge areas.	<b>TEST in sociology, Chapters 1-3</b>

Table 6.2

## Practice Testing

You can do a practice “test” in two ways. One is to test yourself as you are reading or taking in information. This is a great way to add a little variety to your studying. You can ask yourself what a paragraph or text section means as you read. To do this, read a passage in a text, cover up the material, and ask yourself, “What was the main idea of this section?” Recite aloud or write down your answer, and then check it against the original information.

Another, more involved, way to practice test is to create flashcards or an actual test by writing a test. This takes more time, but there are online programs such as Quizlet that make it a little easier. Practice testing is an effective study strategy because it helps you practice *retrieving* information, which is what you want to be able to do when you are taking the real test.

One of the best ways to learn something is to teach it to someone else, so ask a friend or family member if you can explain something to them, and *teach* them the lesson. You may find you know more about the subject than you thought . . . or you may realize quickly that you need to do more studying. Why does teaching someone else rank as one of the most effective ways to learn something? It is a form of practice testing that requires you to demonstrate you know something in front of someone else! No one wants to look like they don’t know what they are talking about, even if your audience is another classmate.

## Recognizing Strengths/Weaknesses of Preferred Study Approaches

Most children don’t learn to ride a bicycle by reading a manual; they learn by watching other kids, listening to instructions, and getting up on the seat and learning to balance—sometimes with training wheels or a proud parent holding on, but ultimately without any other support. They may fall over and feel insecure, but usually, they learn to make the machine go. Most of us employ multiple methods of study all the time. You usually only run into trouble if you stubbornly rely on just one way to learn or study and the material you’re studying or the task you want to accomplish doesn’t lend itself to that preference. You can practice specific strategies to help you learn in your preferred learning approach. Can you think of a time when the way you usually study a situation didn’t work?

When deciding on a study approach, consider what you know about the material and the type of knowledge it involves. Is it a group of concepts related to problem-solving methods, such as those you'd find in a physics class? Or is it a literary analysis of a novel? Consider as many elements as possible about the material -- and the way the material will be assessed -- to help choose a study approach.

You should also consider your instructor's preferred method of teaching and learning. Watching the way they teach lessons or convey necessary course information to the class. Do they almost always augment lessons with video clips to provide examples or create a memorable narrative? Do they like to show you how something works by demonstrating and working with their hands—for instance, assembling a piece of equipment by taking it apart and putting it back together again? Echoing their teaching approach may help your study. That doesn't mean you have to change your entire learning approach to match your instructors' methods. Many instructors understand that their students will have different ways of learning and try to present information in multiple ways.

### Practicing Active Continuous Improvement for All Preferences

You can certainly learn through specific approaches or according to specific preferences, but you will also need to adapt to different situations, skills, and subject areas. Don't limit yourself to thinking you can *only* learn one way or another. That mindset induces anxiety when you encounter a learning situation that doesn't match your preference. What if your instructor *only* uses a spoken lecture to teach concepts in your chemistry class, and you consider yourself a visual learner? Or what if the only method presented to you for learning mathematical computations is to see videos of others working problems, and you're more hands-on? You may have to concentrate in a different way or devise other strategies to learn, but you can do it. In fact, you should sometimes work on the styles/preferences that you feel are your least favorite; it will actually strengthen your overall ability to learn and retain information.<sup>[10]</sup>

Dr. Stephen Covey, famous leadership coach and businessman, called this attention to knowing and honing all your skill sets, not just your favorites, *sharpening the saw*. He advised that people should be aware of their strengths but should always hone their weaknesses by saying, "We must never become too busy sawing to take time to sharpen the saw."<sup>[11]</sup> For instance, in the chemistry lecture example, you may need to take good notes from the spoken lecture and then review those notes as you sketch out any complex ideas or formulas. If the math videos are not enough for you to grasp difficult problems, you may ask for or find your own problems for additional practice covering that particular mathematical concept to solve on your own.

## 6.3 Test Taking

Estimated completion time: 23 minutes.

### Questions to consider:

- What are the differences between test prep and taking the actual test?
- How can you take a *whole person* approach to test taking?
- What can you do on test day to increase your confidence and success?
- What should you know about test anxiety?

10 Newton, Phillip M., & Miah, Mahallad. "Evidence-Based Higher Education—Is the Learning Style 'Myth' Important?" *Frontiers in Psychology* 8:444 (2017) DOI: 10.3389/FPSYG.2017.00444.

11 Covey, Stephen. *The 7 Habits of Highly Effective People* @ <https://www.franklincovey.com/the-7-habits.html>

Once you are practicing good study habits, you'll be better prepared for actual test taking. Since studying and test taking are both part of learning, honing your skills in one will help you in the other.

Probably the most obvious differences between your preparation for an exam and the actual test itself is your level of urgency and the time constraints. A slight elevation in your stress level can actually be OK for testing—it keeps you focused and *on your game* when you need to bring up all the information, thinking, and studying to show what you've learned. Properly executed, test preparation mixed in with a bit of stress can significantly improve your actual test-taking experience.

## Preparation vs. Actual Test

You can replicate the effective sense of urgency an actual test produces by including timed writing into your study sessions. You don't need all of your study time to exactly replicate the test, but you would be well served to find out the format of the exam in advance and practice the skills you'll need to use for the various test components. On one early exam in history, Stuart learned the prof was going to include several short-answer essay questions—one for each year of the time period covered. Stuart set up practice times to write for about 15 to 20 minutes on significant events from his notes because he estimated that would be about how much time he could devote out of the hour-long testing session to write one or two required short-answer questions. He would write a prompt from his notes, set a timer, and start writing. If you're ready and you have practiced and know the material, 20 minutes is adequate to prepare, draft, and revise a short response, but you don't have a lot of extra time.

Likewise, in a math exam, you will need to know what kinds of problems you will have to solve and to what extent you'll need to show your computational work on the exam. If you are able to incorporate this sort of timed problem-solving into your study time, you'll be more prepared and confident when you actually come to the exam. Making yourself adhere to a timed session during your study can only help. It puts a sense of urgency on you, and it will help you to find out what types of problems you need to practice more than ones that perhaps you're more comfortable solving.

## Leveraging Study Habits for Test Prep

In your mind, you probably know what you need to do to be prepared for tests. Occasionally, something may surprise you—emphasis on a concept you considered unimportant or a different presentation of a familiar problem. But those should be exceptions. You can take all your well-honed study habits to get ready for exams. Here's a checklist for study and test success for your consideration:



**Figure 6.9**

Read this list with each separate class in mind, and check off the items you already do. Give yourself one point for every item you checked. If you always take the success steps—congratulations! They are not a guarantee, but doing the steps mindfully will give you a nice head start. If you do fewer than five of the steps—you have some work to do. But recognition is a good place to start, and you can incorporate these steps starting now.

As strange as this may sound, you can find some interesting research articles online about using the taste or smell of peppermint to increase memory, recall, and focus. Read more at: <http://naturalsociety.com/mint-scent-improve-brain-cognition-memory>. While sucking on a peppermint disk won't replace studying, why not

experiment with this relatively easy idea that seems to be gaining some scientific traction?

## Whole Person Approach to Testing

Just because you are facing a major exam in your engineering class (or math or science or English class) doesn't mean everything else in your life comes to a stop. Perhaps that's somewhat annoying, but that's reality. Allergies still flare up, children still need to eat, and you still need to sleep. You must see your academic life as one segment of who you are—it's an important segment, but just one aspect of who you are as a whole person. Neela tries to turn off everything else when she has exams coming up in her nursing program, which is pretty often. She ignores her health, puts off her family, tries to reschedule competing work tasks, and focuses all her energy on the pending exam. On the surface, that sounds like a reasonable approach, but if she becomes really sick by ignoring a minor head cold, or if she misses an important school deadline for one of her children, Neela risks making matters worse by attempting to compartmentalize so strictly. Taking care of her own health by eating and sleeping properly; asking for help in other aspects of her busy life, such as attending to the needs of her children; and seeing the big picture of how it all fits together would be a better approach. Pretending otherwise may work sporadically, but it is not sustainable for the long run.

A whole person approach to testing takes a lot of organization, scheduling, and attention to detail, but the life-long benefits make the effort worthwhile.

## Establishing Realistic Expectations for Test Situations

Would you expect to make a perfect pastry if you've never learned how to bake? Or paint a masterpiece if you've never tried to work with paints and brushes? Probably not. But often we expect ourselves to perform at much higher levels of achievement than that for which we've actually prepared. If you become very upset and stressed if you make any score lower than the highest, you probably need to reevaluate your own expectations for test situations. Striving to always do your best is an admirable goal. Realistically knowing that your current *best* may not achieve the highest academic ratings can help you plot your progress.

Realistic continuous improvement is a better plan, because people who repeatedly attempt challenges for which they have not adequately prepared and understandably fail (or at least do not achieve the desired highest ranking) often start moving toward the goal in frustration. They simply quit. This doesn't mean you settle for mediocre grades or refrain from your challenges. It means you become increasingly aware of yourself and your current state and potential future. Know yourself, know your strengths and weaknesses, and be honest with yourself about your expectations.

## Understanding Accommodations and Responsibilities

As with so many parts of life, some people take exams in stride and do just fine. Others may need more time or change of location or format to succeed in test-taking situations. With adequate notice, most faculty will provide students with reasonable accommodations to assist students in succeeding in test situations. If you feel that you would benefit from receiving these sorts of accommodations, first speak with your instructor. You may also need to talk to a student services advisor for specific requirements for accommodations at your institution.

If you need accommodations, you are responsible for understanding what your specific needs are and communicating your needs with your instructors. Before exams in class, you may be allowed to have someone else take notes for you, receive your books in audio form, engage an interpreter, or have adaptive devices in the classroom to help you participate. Testing accommodations may allow for additional time on the test, the use of a scribe to record exam answers, the use of a computer instead of handwriting answers, as well as other means to make the test situation successful. Talk to your instructors if you have questions about testing accommodations.

## Prioritizing Time Surrounding Test Situations

Keep in mind that you don't have any more or less time than anyone else, so you can't *make time* for an activity. You can only use the time everyone gets wisely and realistically. Exams in college classes are important, but they are not the only significant events you have in your classes. In fact, everything leading up to the exam, the exam itself, and the post-exam activities are all one large continuum. Think of the exam as an event with multiple phases, more like a long-distance run instead of a 50-yard dash. Step back and look at the big picture of this timeline. Draw it out on paper. What needs to happen between now and the exam so you feel comfortable, confident, and ready?

If your instructor conducts some sort of pre-exam summary or prep session, make sure to attend. These can be invaluable. If this instructor does not provide that sort of formal exam prep, create your own with a group of classmates or on your own. Consider everything you know about the exam, from written instructions to notes you took in class, including any experiential notes you may have from previous exams, such as the possibility of bonus points for answering an extra question that requires some time management on your part. You can read more about time management in Chapter 3.

### GET CONNECTED



Which apps can help you study for a test, increase your memory, and even help you overcome test anxiety?

[Personal \(https://personalzen.com/\)](https://personalzen.com/) Zen is a free online gaming app clinically proven to reduce stress and anxiety. The games retrain your brain to think more positively, reducing stress to help you focus on the experiences around you.

Games like solitaire, hangman, and Simon Says all build on your memory, keeping it sharp and active. There are loads of fun, free online memory games you can use to make time wasting a little less wasteful. For more than 250 options, visit the [Memory Improvement Tips \(https://www.memory-improvement-tips.com/free-online-memory-games.html\)](https://www.memory-improvement-tips.com/free-online-memory-games.html) website.

[iTunes University \(https://apps.apple.com/us/app/itunes-u/id490217893\)](https://apps.apple.com/us/app/itunes-u/id490217893) might be able to help you dig into a research topic or find additional content to help you if you're struggling with a course. Their library of free lectures and content comes from some of the most highly respected universities around the world.

[Chegg Prep \(https://www.chegg.com/flashcards\)](https://www.chegg.com/flashcards) is a flashcard-based self-quizzing resource. It provides millions of pre-made flashcards and decks organized by course and topic, which you can search, sort,

bookmark, and use in a variety of ways. The service is free and does not require a login unless you'd like to save or create your own cards.

## Test Day

Once you get to the exam session, try your best to focus on nothing but the exam. This can be very difficult with all the distractions in our lives. But if you have done all the groundwork to attend the classes, completed the assignments, and scheduled your exam prep time, you are ready to focus intently for the comparatively short time most exams last.

### Arriving to class:

Don't let yourself be sidetracked right at the end. Beyond the preparation we've discussed, give yourself some more advantages on the actual test day:

- Get to the testing location a few minutes early so you can settle into your place and take a few relaxing breaths.
- Don't let other classmates interrupt your calmness at this point.
- Just get to your designated place, take out whatever supplies and materials you are allowed to have, and calm your mind.

### Taking the test:

Once the instructor begins the test:

- Listen carefully for any last-minute oral directions that may have changed some detail on the exam, such as the timing or the content of the questions.
- As soon as you receive the exam sheet or packet, make a quick scan over the entire test.
- Don't spend a lot of time on this initial glance, but make sure you are familiar with the layout and what you need to do.
- Using this first review, decide how you will allocate your available time for each section.
- You can even jot down how many minutes you can allow for the different sections or questions.

Then for each section, if the exam is divided this way, be sure you **read the section directions** very carefully so you don't miss an important detail. For example, instructors often offer options—so you may have four short-answer questions from which to choose, but you only need to answer two of them. If you had not read the directions for that section, you may have thought you needed to provide answers to all four prompts. Working on extra questions for which you likely will receive no credit would be a waste of your limited exam time. The extra time you spend at the beginning is like an investment in your overall results.

**Answer every required question on the exam.** Even if you don't complete each one, you may receive some credit for partial answers. Whether or not you can receive partial credit would be an excellent question to ask before the exam during the preparation time. If you are taking an exam that contains multiple-choice questions, go through and answer the questions about which you are the most confident first.

**Read the entire question carefully even if you think you know what the stem (the introduction of the choices) says, and read all the choices.** Skip really difficult questions or ones where your brain goes blank. Then you can go back and concentrate on those skipped ones later after you have answered the majority of the questions confidently. Sometimes a later question will trigger an idea in your mind that will help you

answer the skipped questions.

And, in a similar fashion to spending a few minutes right at the beginning of the test time to read the directions carefully and identify the test elements, **allow yourself a few minutes at the end of the exam session to review your answers.** Depending on what sort of exam it is, you can use this time to check your math computations, review an essay for grammatical and content errors, or answer the difficult multiple-choice questions you skipped earlier. Finally, **make sure you have completed the entire test:** check the backs of pages, and verify that you have a corresponding answer section for every question section on the exam. It can be easy to skip a section with the idea you will come back to it but then forget to return there, which can have a significant impact on your test results.

## After the Test

As you leave the exam room, the last thing you may want to think about is that particular test. You probably have numerous other assignments, projects, and life obligations to attend to, especially if you pushed some of those off to study for this completed exam. Give yourself some space from this exam, but only for the duration of the time when your instructor is grading your exam. Once you have your results, study them—whether you did really well (Go, you!) or not as well as you had hoped (Keep your spirits up!). Both scenarios hold valuable information if you will use it.

Thandie had a habit of going all-out for exams before she took them, and she did pretty well usually, but once the instructor passed back the graded tests, she would look at the letter grade, glance half-heartedly at the instructor's comments, and toss the exam away, ready to move on to the next chapter, section, or concept. A better plan would be to learn from her exam results and analyze both what she did well and where she struggled. After a particularly unimpressive exam outing in her statistics class, Thandie took her crumpled-up exam to the campus tutoring center, where the tutor reviewed the test with her section by section. Together they discovered that Thandie did particularly well on the computational sections, which she admitted were her favorites, and not well at all on the short-answer essay questions that she did not expect to find in a stats class, which in her experience had been more geared toward the mathematical side of solving statistical problems.

Going forward in this class, Thandie should practice writing out her explanations of how to compute the problems and talk to her instructor about ways to hone this skill. This tutoring session also proved to Thandie the benefit of holding on to important class papers—either electronically or in hard copy, depending on the class setup—for future reference. For some classes, you probably don't need to keep every scrap of paper (or file) associated with your notes, exams, assignments, and projects, but for others, especially for those in your major, those early class materials may come in very handy in your more difficult later undergraduate courses or even in grad school when you need a quick refresher on the basic concepts.

## Test Anxiety



**Figure 6.10** Text anxiety can be a common occurrence, but you can use strategies to manage it.

Test anxiety is very real. You may know this firsthand. Almost everyone gets a little nervous before a major exam, in the same way most people get slightly anxious meeting a new potential date or undertaking an unfamiliar activity. We second-guess whether we're ready for this leap, if we prepared adequately, or if we should postpone this potentially awkward situation. And in most situations, testing included, that reasonable level of nervous anticipation can be a good thing—enhancing your focus and providing you with a bit of bravado to get you through a difficult time.

Test anxiety, however, can cause us to doubt ourselves so severely that we underperform or overcompensate to the point that we do not do well on the exam. Don't despair; you can still succeed if you suffer from test anxiety. The first step is to understand what it is and what it is not, and then to practice some simple strategies to cope with your anxious feelings relative to test taking. Whatever you do, don't use the label *test anxiety* to keep you from your dreams of completing your education and pursuing whatever career you have your eyes on. You are bigger than any anxiety.

### Understanding Test Anxiety

If someone tries to tell you that test anxiety is *all in your head*, they're sort of right. Our thinking is a key element of anxiety of any sort. On the other hand, test anxiety can manifest itself in other parts of our bodies as well. You may feel queasy or light-headed if you are experiencing test anxiety. Your palms may sweat, or you may become suddenly very hot or very cold for no apparent reason. At its worst, test anxiety can cause its sufferers to experience several unpleasant conditions including nausea, diarrhea, and shortness of breath. Some people may feel as though they may throw up, faint, or have a heart attack, none of which would make going into a testing situation a pleasant idea. You can learn more about symptoms of test anxiety from the Anxiety and Depression Association of America that conducts research on this topic.<sup>[12]</sup>

Back to our minds for a minute. We think constantly, and if we have important events coming up, such as

12 Retegui, Jo-Ann. "Relationship between anxiety and standardized patient test performance in the medicine clerkship." *Journal of general internal medicine* vol. 21,5 (2006): 415-8. doi:10.1111/j.1525-1497.2006.00419.

exams, but other significant events as well, we tend to think about them seemingly all the time. Almost as if we have a movie reel looping in our heads, we can anticipate everything that may happen during these events—both sensational results and catastrophic endings. What if you oversleep on the test day? What if you're hit by a bus on the way to campus? What if you get stung by a mysterious insect and have to save the world on the very day of your exam?

How about the other way? You win the lottery! Your screenplay is accepted by a major publisher! You get a multimillion-dollar record deal! It could happen. Typically, though, life falls somewhere in between those two extremes, unless you live in an action movie. Our minds, however, (perhaps influenced by some of those action movies or spy novels we've seen and read) often gravitate to those black-and-white, all-or-nothing results. Hence, we can become very nervous when we think about taking an exam because if we do really poorly, we think, we may have to face consequences as dire as dropping out of school or never graduating. Usually, this isn't going to happen, but we can literally make ourselves sick with anxiety if we dwell on those slight possibilities. You actually may encounter a few tests in your academic careers that are so important that you have to alter your other life plans temporarily, but truly, this is the exception, not the rule. Don't let the most extreme and severe result take over your thoughts. Prepare well and do your best, see where you land, and then go from there.

## Using Strategies to Manage Test Anxiety

You have to work hard to control test anxiety so it does not take an unhealthy hold on you every time you face a test situation, which for many of you will last well into your careers. One of the best ways to control test anxiety is to be prepared for the exam. You can control that part. You can also learn effective relaxation techniques including controlled breathing, visualization, and meditation. Some of these practices work well even in the moment: at your test site, take a deep breath, close your eyes, and smile—just bringing positive thoughts into your mind can help you meet the challenges of taking an exam without anxiety taking over.

The tests in the corporate world or in other career fields may not look exactly like the ones you encounter in college, but professionals of all sorts take tests routinely. Again, being prepared helps reduce or eliminate this anxiety in all these situations. Think of a presentation or an explanation you have provided well numerous times—you likely are not going to feel anxious about this same presentation if asked to provide it again. That's because you are prepared and know what to expect. Try to replicate this feeling of preparation and confidence in your test-taking situations.

Many professions require participants to take frequent licensing exams to prove they are staying current in their rapidly changing work environments, including nursing, engineering, education, and architecture, as well as many other occupations. You have tools to take control of your thinking about tests. Better to face it head-on and let test anxiety know who's in charge!



## Summary

Studying and taking tests will always be a large part of college, so learning now to do these well can only help you be more successful. Experts provide us with many tools, techniques, and ideas to use when we determine how best to study, use our memories effectively, and prepare to take exams. You can help yourself by taking these guidelines seriously and tracking your progress. If one strategy works better for you in some classes and another is more suited to a different course, keep that in mind when you begin to study. Use all the resources

available to you, and you'll be well on your way to success in college.



## Career Connection

Studies have shown that parents contribute to test anxiety in children by drawing students' attention to the test day and increasing pressure to perform well. Do you think that worrying about an upcoming test is as harmful as anxiety while taking the test? What do you think can be done to minimize worry?

This [article \(https://openstax.org//testanxiety\)](https://openstax.org//testanxiety) discusses how to help with test anxiety.



## Rethinking

Revisit the questions you answered at the beginning of the chapter, and consider one option you learned in this chapter that might change your answer to one of them.

How confident are you in your skills at preparing for and taking tests? Take this quick survey to figure it out, ranking questions on a scale of 1–4, 1 meaning “least like me” and 4 meaning “most like me.”

1. I believe I set aside enough time to prepare for tests.
2. If I don't set aside enough time, or if life gets in the way, I can usually cram and get similar results.
3. I prefer to pull all-nighters. The adrenaline and urgency help me remember what I need come test time.
4. I study my notes, highlight book passages, and use flash cards, but I still don't feel like I'm as successful as I should be on tests.



## Where do you go from here?

Studying and test taking skills often need to evolve to meet the needs of college responsibilities. What would you like to learn more about? Choose a topic from the list below and create an annotated bibliography that would direct further research.

- the importance of memory in learning new material
- strategies to increase memory
- strategies to increase the effectiveness of studying
- test anxiety