How to succeed

Many students find studying for college level classes to be a new challenge, and are not prepared to meet it. This document discusses five important steps to succeeding in a statistics course: Read the textbook, Believe in yourself, Stay healthy, Put in the hours, and Relax.

1.) Read the textbook. Jeff spent 30 hours total over the course of four weeks preparing for his exam. He carefully highlighted all the important points, transferring them to index cards to be memorized. He subsequently failed the exam. Should he study even *more* hours?

Learning and knowledge operate on many different levels, including memorization (declarative knowledge or recall), knowing how to apply it (procedural knowledge), knowing when to apply it (contextual knowledge), knowing how it is similar to or different from other ideas (comparison knowledge), and knowing why it is appropriate in a particular situation (conceptual knowledge). Familiarity with a topic (memorization of a definition) often increases students' confidence in their knowledge, because students fail to differentiate between knowing a topic (recognizing it) and *knowing* it (knowing how to use it).[1] It is Jeff's misplaced confidence in his abilities after his familiarity with the material that makes him believe he is ready for the test.

Jeff should try a *different* strategy, not necessarily one involving more hours. After reading a section, answer the following questions: How would a statistician use this information in the context of a study? When is it appropriate to use this information? When is it inappropriate to use this information? Why is this concept appropriate or inappropriate to use in a given situation? How is this concept similar to or different from others in this section or chapter, or other chapters? Which part of a study is this concept used in: data collection, data description, probability, or inference? What else do I need to know in order to fully understand this information? The textbook often has examples in the middle of and at the end of a section that test the different types of knowledge that we're interested in having our students master. Answer these questions yourself before reading the answers.

The SQ3R method (Survey, Question, Read, Recite, Review) might be great if you're trying to memorize and regurgitate information. But declarative knowledge, or recall, or memorization is not the kind of knowledge we expect out of our statistics students. None of the questions on our exams have to do with this kind of knowledge; you're allowed a cheat sheet on all exams. All of the exam questions will ask you to have a deeper level of knowledge than mere recall. Passive reading rarely results in recalling information very long, anyway, and is often a waste of your time. Actively ask and answer questions as you read to keep your mind focused on the material and to make sure you're actually learning.

Another strategy to use in office hours to make sure you're understanding the concepts instead of just memorizing the material is to attempt to teach the instructor. It sounds silly, but you might preface your explanation with, "Let me make sure I understand this correctly." Students who practice this technique are very likely to make an "A" because this is such an excellent way to spot

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[1] Abrose, S. A., Dunkle, K. L., Lazarus, B. B., Nair, I., & Harkus, D. A. (1997). *Journeys of women in science and engineering: No universal constants.* Philadelphia: Temple University Press. P. 212.

misunderstandings that can be fixed before the exam. I had a student Fall 2012 who spent about 3-5 minutes after every class asking clarification questions like this, and subsequently was one of my best students. A few minutes can make a world of difference.

2.) Believe in yourself. Marie tells herself, "I'm not good at math," so she "knows" that no matter how hard she works on the homework or how much time she spends reading the textbook or going to class, she'll never understand the material. As a result, she haphazardly guesses at some of the homework problems and doesn't "waste" time reading the textbook, instead focusing on other classes where she knows she can perform better. Why even try?

Students who believe their success comes from a combination of ability and effort instead of uncontrollable causes like luck are more likely to be motivated to put in effort and persistence required to succeed in the future[2]. If you have been admitted to Texas A&M University, you are smart! You definitely have the ability to succeed. Certainly be prepared for new challenges sometimes not offered to high school students, but remember that your brain is like a muscle. Just because you can't bench press 150 pounds today doesn't mean you never will; keep on studying, and your *abilities* will increase!

On average, we tend to take credit for successes ("I made an A!") and blame our environment for failure ("My teacher failed me"), which is probably good for our self-esteem. But focusing on elements of the class that you can control, like study strategies, class attendance, good time management, and hard work, can help motivate you and feel more confident and in control of your grade.

3.) Exercise, eat your vegetables, drink water, and get enough sleep. Andre is very busy with working 20 hours a week in addition to taking a full load of classes, and on the weekends he needs a break. He gets a little more behind each week, telling himself he'll study for the test whenever it comes around. But all five of his professors schedule exams for the same week, so he "has" to pull an all-nighter to make sure he's ready for the exam. During his statistics exam, there are so many words on the page, all the sentences look exactly the same, and he almost goes cross-eyed trying to guess at which one might be correct.

Despite a great deal of researching showing otherwise[3] [4], students continue to believe that pulling an all-nighter is the best method of preparing for an exam for them, because they are a night owl or because they drink coffee. But many of the questions we're asking in statistics classes involve processing of information stored in long-term memory rather than memorization and regurgitation. You're allowed a cheat sheet on the exam, so if you're afraid you'll forget something, simply write it down. The day of the exam, you'll need to have your brain completely awake to process the long, challenging questions, so you'll be better prepared for the exam by getting a good night's sleep than you will studying all night.

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[2] Weiner, B. (1986.) *An attributional theory of motivation and emotion.* New York: Springer-Verlag.
[3] Gillen-O'Neel, C., Huynh, V., & Fuligni, A. (2012). "To Study or to Sleep? The Academic Costs of Extra Studying at the Expense of Sleep." *Child Development.* DOI: 10.1111/j.1467-8624.2012.01834.x
[4] http://www.msnbc.msn.com/id/22259233/ns/us_news-education/t/study-all-nighters-hurt-students-grades/#.UDqR5KPlmeY

4.) Put in the hours. If Andre also has kids or 20 hours a week of extracurricular activities to attend, he is taking too many classes. As he gets farther and farther behind, he'll be more likely to drop into despair and depression from not having the time to attend to each of his responsibilities with the amount of time they deserve.

The University officially says[5] you should be studying 3 hours for every hour you're in our class. You wouldn't expect someone who had only been running for 30 minutes a week to be able to run a marathon. Similarly, you can't expect to do well on an exam if you've only been working on the homework only 30 minutes a week.

To keep from wasting too much time on a single question or getting depressed that statistics is too hard, try using the 10-minute rule. When you get stuck on a question, commit to using 10 minutes to try to figure out the answer. Spend those 10 minutes looking up the topic in the textbook, re-reading that section, and working through a practice problem. Also try looking for a similar example in a lab or in the class notes. We can all work on something for 10 minutes, even laundry. Take notes on what word or formula you might need more help with, and if you can't figure out the answer yourself in 10 minutes, post a note on the discussion board, ask the instructor in class, or come to office hours.

5.) Relax. Al "knows" that he is bad at math, and works himself into a sweat studying the night before the exam. The more he tries to study, the more the problems look like Greek, and the more panicked he gets. The more fearful he becomes, the more his brain shuts down, and he becomes even more afraid.

Fear of math is a common problem in American culture. While we believe it to be unacceptable to be afraid of reading, and encourage students to work hard to become better readers, it is culturally acceptable to be "bad at math," and we sympathize with students struggling with math rather than encouraging them to work hard. We brag that we're "bad at math," but we are ashamed at being bad at reading.

In one study,[6] people with high and low math anxiety were asked to work problems while in an fMRI scanner. Those participants who had high math anxiety showed activation in the neural areas associated with bodily harm when told they were about to work a math problems. That is, participants "knew" that the math problem was going to hurt! Interestingly, the same areas of the brain were not activated while actually working the problem; it was only the anticipation of the problem that was painful.

One way to overcome this anxiety is to journal about it. Worrying about your performance uses up valuable thinking and resources in your brain, which can actually make you perform worse, validating

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[5] http://slc.tamu.edu/study-tips/time-management/: 2 hours, 3 for more difficult classes.

[6] http://thechart.blogs.cnn.com/2012/10/31/for-math-phobic-numbers-pose-threat-of-pain/ Lyons IM, Beilock SL (2012) When Math Hurts: Math Anxiety Predicts Pain Network Activation in Anticipation of Doing Math. PLoS ONE 7(10): e48076. doi:10.1371/journal.pone.0048076. http://www.plosone.org/article/info:doi/10.1371/journal.pone.0048076

your fears. In one study,[7] it was found that writing about these anxieties right before the test may boost the grade. Arrive in your testing location a few minutes early, and write down whatever you are afraid of: making a bad grade, disappointing your parents or friends, not being able to get a good job, and so on. Writing may alleviate the impact of worries on performance for students who are more anxious than most.

[7] http://thechart.blogs.cnn.com/2011/01/13/writing-about-anxiety-may-boost-test-scores/ Ramirez, et al. (2011) Writing About Testing Worries Boosts Exam Performance in the Classroom. Science 331(211). doi: 10.1126/science.1199427. http://educationgroup.mit.edu/HHMIEducationGroup/wp-content/uploads/2011/09/Science-2011-Ramirez.pdf