

THE SUCCESSFUL NATURAL SCIENCES STUDENT

LESSON 1

A FABLE: THE ACTIVE LEARNER AND THE PASSIVE LEARNER

Ziquang the Passive Learner. Ziquang has never missed a lecture. Ziquang goes to two discussion sections a week. Ziquang reads and rereads the chapters in the text. Ziquang has hired a tutor. Ziquang has worked and reworked all of the questions from last year's exams one hundred times. On the day of the test I ask Ziquang if he can name the seven strong acids. He only knows three. Ziquang gets a 65 on the exam.

Indirah the Active Learner. Indirah sleeps until 4 each day and has never come to lecture. Indirah never bought the text book. On the day before the test Indirah gets on the web and finds out what the 30 questions are on the exam. One of them is to name the strong acids. Indirah memorizes all seven acids. She also stays up all night and learns how to answer the other 29 questions. On the day of the test I ask Indirah if she can name the seven strong acids. She does. Indirah gets a 92 on the exam.

The Moral of the Story. The moral is not that you should skip class and stay up all night before the test. The moral is that you have to be able to prove to yourself that you are learning the material that is on the exam. How you do it I don't care. But be aware that there is no guarantee that being a good little boy or girl will get you an A like it did in high school. Learn the material and I will give you an A. Don't and I will be happy to console you before explaining what it means to be an active learner.

LESSON 2

YOU'VE GOT TO KNOW WHAT YOU DON'T KNOW

The wisest thing I ever heard a student say. A young woman was asked by an incoming freshman what it took to be successful at UT. She replied, "you have to know what you don't know."

Imagine sitting down by yourself just before an exam and seeing how much stuff about the test you can actually write down, or say out loud, with nothing in your possession but your brain. After all, on the exam that giant back pack of material and that computer and those friends you studied with you will be of no help at all. Don't fool yourself that just because you studied hard (whatever that means), that you are prepared for the exam.

Moral of the Story? The only way you can know for certain that you will do well on the exam is if you can isolate yourself from your learning environment and really assess what you know, and what you don't know. In that quiet time, if you can spend an hour explaining to yourself what will be on the exam, and you never have to hesitate, or can always find vocabulary (other than the word "thingy") to express yourself, then you will do fine on the exam. And if you can't? You are just kidding yourself that you are prepared. Oh, and if you don't want to know the truth, and you walk into the exam having never really queried yourself about what you know and don't know, you are simply gambling with your grade.

LESSON 3

ACHIEVING PERFECTION IS HOW YOU EARN AN A IN COLLEGE

High school was great. You glanced over the material on the study guide for a 20 question test, and then you took the exam. You "kind of" or "sort of" knew the material. And your teacher was just thankful you were coming to class and weren't a jerk. So when it came time to grade the exam, even though you actually only got 10 questions right, for the 10 questions you got wrong, you "almost" got them right and with four points of partial credit on each question, you received your A for the test and a ticket to UT. Congratulations.

College is not so great. It seems like half your exams are multiple-choice. And after studying for your 20-question exam, you "kind of" or "sort of" know the material. Oh, this time your professor doesn't care if you studied enough. She just wants to know that you learned it. So you take a multiple choice test and get 10 questions right, and for ten other questions, that you "kind of" or "sort of" know, you find a really good answer

that happens to be almost right. For all that effort spent almost learning, you get a zero on the question, an F for the test, and a conversation with your parents about alternate career choices. Welcome to college.

Moral of the story? You need to tweak that calibration curve on what it means to know what you know. College demands a lot more.

LESSON 4

THERE ARE DOZENS OF RESOURCES FOR LEARNING THE MATERIAL—FIND THE RIGHT ONES FOR YOU

You will want to identify an efficient and effective approach to getting an A in a course. Understand that learning to study successfully at the college level is an ongoing effort and that if you find yourself performing poorly, then this is an indication that you need to change—it is up to you to figure out which approaches works best and constantly be refining your strategies for learning.

Listed below are examples of the many resources typically available for the science and math courses you will take at UT. Mix and match them to come up with what makes you a successful student.

Lecture. From a testing perspective, the most important thing about going to class is **finding out what you are expected to learn to get a good grade** (and that is the reason you should always go to class.) It is a perk if the professor is also a dazzling lecturer who can really teach you something you will remember during a 50 or 75 minute time period. So just because you come to class daily and then nod off, or day dream, or act like a stenographer copying off the board, doesn't mean you have helped yourself at all in preparation for an exam. In many ways, the lecture is the least important thing you will do in terms of active learning.

Lectures on Demand. Increasingly faculty are posting their lectures on line for you to download and watch. This can become a more effective way to view lectures than the real-time version since you will be able to pick and choose exactly what you need to hear. For my course you can find the videos at http://cns.utexas.edu/cns_lectures/

Lecture Notes. Regardless of whether you go to class, someone has created some really good course notes. Maybe it is the professor. Maybe it is a classmate. Maybe it is you who was a really good stenographer. Whoever did the work, get a hold of these notes and to the best of your ability, know them thoroughly—don't just look at them, **KNOW THEM**. As a test, put them away and see how well you can recreate them from memory. After all, they are what the professor thought was important and they will be 99% of any exam.

Discussion sections, office hours, study groups. Everyone needs a secondary learning environment where they can go to have questions answered and, in general, engage in intellectual discussion about the subject matter. Make sure you provide yourself this opportunity by finding yourself a discussion section, office hour or study group each week that fits your schedule and going every week. By the way, there is no more wasted time than time spent in a discussion section or study group unprepared, so go in knowing what it is you want to learn and ready to be an active learner.

Academic Communities Study Groups. Study group tables form five nights a week in the residence hall dining rooms as part of the CNS Academic Communities. For more information on how to use these communities to help you with all of your math and science classes, please check out the Academic Communities website: http://cns.utexas.edu/students/academic_community_programs/.

Worksheets and problem sets. Most every science or math course provides students with supplemental problems and worksheets to help you master the material. Of course you should do these problems, but appreciate that working them with a friend, or with an answer key, really reduces the likelihood you will be able

to do the problems by yourself on an exam. Don't fool yourself by reworking the same problems multiple times!!

Textbooks. Your textbook provides an eloquent description of the course material—actually wayyyy too eloquent of a description. Understand two things about textbooks: they always have more material in them than your instructor wants you to know and there are a dozens of other textbooks in the library that you might find to be a better learning resource. Don't be afraid to use a different book.

Textbook problems. There are plenty of problems in textbooks to work. Since these questions approximate the content and difficulty of exam questions (albeit in a different format), they are a useful way to study and test your knowledge, but unless actually assigned by the professor, they might not approximate what you will be asked to learn for an exam.

Textbook support materials. You can purchase supplemental materials with most every textbook, such as answer keys and textbook outlines and study guides. You can also use the CDs provided with the text to engage you in computer-assisted exercises to test whether you have learned the material. However unless you are independently wealthy I rarely see the reason to make these purchases when you have the internet available to do the same thing.

Internet. Type any topic area you want into a search engine and you will retrieve about 4.6 million web sites that are constructed to assist with your education. One site to absolutely book mark is the one associated with your text book. In most cases it offers an array of materials from outlines to sample problems to multimedia downloads that can be more useful and easier to navigate than the text itself. And if you find another site on the web that teaches you better, bookmark it as well.

Write your own problems. Be an active learner. If you can learn to write your own questions, then you will really know that you have learned the material. It is actually not that hard once you put yourself in the position of thinking about what should go into a question. This is the number one way you will know that you know the material.

A thought on tutoring. Some people think they can buy a grade. So they shell out \$30 an hour to observe someone else prove they know the material. You've already heard your professor give a lecture on the subject that is a lot better than the tutor, and you can go (for free) to scores of discussion sections and study groups. So the only real reason to pay a tutor is to have someone act like your mom or dad and force you to sit in your room and study. So pay your roommate \$10 an hour to do the same and save.

So should you use all of these resources? Of course not. So which should you use? The ones that get you an A the faster and cheapest. Which ones are those? How do I know? Everyone is different—figure out what works for you and do it. But always be ready to change because just about the time you figure out how to ace one course, you will have another course that requires a different form of studying to be successful.