Survival Guide for Students Taking University Courses in Science and Mathematics

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Prologue

Adjusting to the World of University Study
As you begin your studies as a university student you are entering a new world; one that is different from the world you have known. A university is not just another kind of high school; one offering more advanced courses than those in the twelfth grade. A university represents an entirely different kind of environment and will call upon you to work in a new way. You are entering a new culture and your success depends upon your willingness and ability to adjust to this new culture. One of the tasks facing your instructors will be to help you make this adjustment and you should cooperate with them as they try to help you.

Science and Mathematics Anxiety

Everyone Experiences Science and Mathematics Anxiety
Quite understandably, you may feel some anxiety about the science and mathematics that you will have to take in your university studies. How will you cope? Will they be too hard? Will they fit seamlessly with the science and mathematics courses you have had in the past or will you discover a gap that needs to be bridged before you can study the new material successfully? Will the instructor explain the material clearly enough and slowly enough for you to learn it? Will the examinations be fair, allowing you to show what you know?

One of the common emotions felt by beginning university students is the one known as mathematics anxiety. This anxiety is also felt by students studying science, particularly chemistry and physics, but it has been of particular concern to the mathematical community. If you experience this anxiety, do not interpret it as a sign that there may be something wrong with you. As a matter of fact, if you experience science or mathematics anxiety, then you are in good company. We all feel it.

Those who claim that science and mathematics are easy are either lying, or have let so much time elapse since they last did any study themselves, that they have forgotten how hard and demanding that study can be. The study of science and mathematics can also be rather intimidating. Everyone, from the students who struggle with elementary courses to the distinguished professors who occupy the most prestigious positions in the science and mathematical world, all regard their disciplines with a healthy respect tinged with a little fear. Your science or mathematics instructor knows more about the subject matter than you do and will be well acquainted with the material that he or she will be teaching you, and will therefore be able to explain it effortlessly and fluently. But that does not mean that your instructor is comfortable with all of the subject matter in his or her field. No matter who we are, every one of us has a frontier to our understanding. When we think about the subject matter at our own personal frontiers, then we are just
as scared as you are.

**What to Do About Science and Mathematics Anxiety**

There is a very simple remedy that will overcome much of your anxiety and help you to do well in your courses. Since every person struggles at his or her frontier of understanding, all you have to do, in order to succeed, is to make sure that your own frontier is beyond the level of the questions that you will be answering in your examinations. The courses that you will take are designed to help you do just that. These courses are specifically tailored to your needs and to the level of understanding that you are expected to have as you enter them. Your instructor is not trying to trap you; nor will you be required to come up with a burst of inspiration under the pressure of an examination. Your examinations will not torture you with tricky questions or brain twisters. Instead, they will be designed to give you the opportunity of showing that you have learned the material of your course. If you have studied the material, then you will find the examination questions to be routine, asking you to solve problems that you have solved before and can solve again with confidence.

**Will I Enjoy My Courses?**

One last comment before we leave this prologue: You will notice that this prologue has said nothing, so far, about enjoyment of the study process. Will you enjoy your study of science or mathematics? Yes you will; some of the time. It will be the dearest wish of your instructor that you should enjoy your studies as often as possible and feel that sense of pride and achievement that comes from an understanding of the basic scientific principles or mathematical concepts that govern our everyday lives. But you will not enjoy all of your studies all of the time. It simply isn’t possible. There will be times when your studies are dreary, times when they are painful, times when they may even be a little frightening, times when you will have no idea why your instructor is choosing to present certain material to you. So you won’t be having fun all of the time. We offer you no instant gratification. Please understand that success in this life depends upon your willingness to persevere with a task even when it isn’t fun and even when it is painful or frightening. When you are done, the sense of pride you will feel in your achievement will more than compensate you for the work you have done.
A Blueprint for Student Success

Introduction
Your success in your studies is not the sole responsibility of your instructors. It is primarily your responsibility. It is your responsibility to make sure that you are properly prepared for each course that you take and that you can afford to devote enough quality time on a regular basis to ensure that you make a proper effort to study the material. Read the following paragraphs carefully and take them seriously.

Conducting Yourself as a Student
Your instructor is a highly trained and highly skilled and dedicated professional whose level of expertise extends to the frontier of knowledge in the material that he or she is teaching you. Furthermore, your instructor cares deeply about your success and has spent many years of his or her life wrestling with the difficulties that are presented both to instructor and student by the kind of course in which you are enrolled.

From a standpoint of ignorance of the material, ignorance of where that material is leading and ignorance of how your present studies relate to more advanced study inside or outside of the discipline, you are not in a position today to pass judgment on the contents of your courses, nor on the way in which they are examined. The knee-jerk subjective opinions that you may hold today could well be very different from the opinions you will hold two years from now when you understand more about the role that your present courses have played in your longitudinal development. Place your trust in the professional expertise of your instructor and do the work of the course. You have come to university to learn; not to pontificate.

Being Prepared for the Study of University Science and Mathematics
Knowing the Prerequisite Material
The very nature of science and mathematics dictates that each course you take must rely upon the understanding of the subject matter that you are supposed to have attained in your earlier courses. It is not good enough for you to have official credit for those earlier courses. If those earlier courses are prerequisite to your present course, that means that your present course depends upon your knowledge of the material in those earlier courses. Moreover, your present course is probably more advanced than the earlier courses and will expect you to be able to work rapidly, painlessly and correctly with all earlier material leaving the force of your concentration available for the new material that you are about to study.
Your High School Background
The ease with which you will cope with your first university courses in science or mathematics depends, more than anything else, upon the courses you took in the twelfth grade. If you made the tragic mistake of not doing very much mathematics in your twelfth grade, then you may have compromised your ability to manage university science and mathematics courses, and it may be necessary for you to take a refresher course or to engage a good tutor in order to ensure your future success.

Bridging the Gaps
Knowing that many students in a class are unprepared to a greater or lesser degree, your instructor will make every attempt to help you bridge whatever gaps that may exist. But it is not your instructor’s responsibility to ensure that the gap has been bridged. It is yours. Your instructor will be walking a tight-rope, trying to bridge the gap as much as possible for students who come into the course unprepared, and yet, trying to cover the material of the course well enough to ensure that those students who will be progressing to the next level will not have to bridge another gap there. Try to understand that, in a class of thirty five students, there are many different needs. Satisfying all of your needs may mean satisfying fewer needs of other people.

Expect your Future Courses to be More Demanding
You should understand that, in general, university study is more demanding than high school study and that it includes more advanced and demanding material. In order to be a successful university student you should normally be someone who managed well in high school and who retains the knowledge that was achieved there. Sometimes, however, a student blooms late. That’s fine but don’t forget that the earlier material still has to be studied. If you ignore it, then it will eventually come back to haunt you and will interfere with your studies like a festering sore.

Laying the Foundation of Future Success During Childhood
You may believe that the greatest single factor in your success or failure as a university student is the quality and care that you receive from your instructors there. In fact, the greatest single factor in your success as a university student is the quality of the interaction that took place between you and your parents when you were a little child. Without that quality interaction with your parents, you may still succeed but the process will be much harder.

Adjusting your Lifestyle

Combining Employment with University Study
Being a student is a full time and difficult job. It is a sad reality of life that many students are compelled to seek employment while they are enrolled at a university. If you have to work for a living, then be aware that conditions in your life are not ideal for study. Do not expect to be able to work long hours at your job and also
take a heavy course load. You would serve your interests better if you took only a few courses at a time and worked properly at them with real intent to know and understand the material.

Bear in mind that, if you overload yourself and fail courses, then you will lose more time than would be lost by reducing your course load. Even worse than failing a course is that you may officially pass a course without really understanding its contents. Then, at the next level of study you may face very serious problems.

**Getting Enough Sleep**

Are you sleeping enough? One of your obligations as a university student is to go to bed at a reasonable time and to sleep eight hours every night. You need to enter the lecture room wide awake and able to devote your best concentration to the material that is being provided there.

**Using Drugs**

Are you using drugs? If you are, then you are making it virtually impossible to succeed as a student. If you have experimented with drugs even once in your life, then you already have one strike against you. You should also know that some types of drugs, including many stimulants, are known to cause permanent brain damage with just one or two high dosage uses or with a large number of low dosage uses. This brain damage that may not show up in many walks of life but could well affect your ability to cope in demanding university courses in science or mathematics.

**How to Approach Your Studies**

This section will sum up many of the basic principles that should guide you in your quest to become a successful university student. Read these instructions careful and resolve to follow them.

**Your Primary Objective in Each Lecture**

The most important principle that should guide you in your studies is that the purpose of your study is to enable you to understand the contents of the lectures that you attended in the classroom. Part of the mechanism of understanding the material contained in those lectures is the doing of homework problems. Thus, one does homework problems in order to understand the lectures. Do not make the mistake of thinking that the homework problems are your primary objective. In other words, do not make the mistake of thinking that the purpose of your lectures is to provide you with instructions for doing homework problems. Use the homework problems as a tool to help you understand each lecture.

**The Bulk of Your Learning Takes Place After the Lecture is Over.**

Do not expect to attain complete understanding of the material while you are actually in the classroom. No one learns science or mathematics by hearing someone else talk. As a matter of fact, no one learns science or mathematics by reading a book or by reading lecture notes. As important as all these activities
Coming to Each Lecture Properly Prepared
If you enter a lecture having made a proper study (including closed book rewriting) of the material of the preceding lecture, then you will find it easy to understand the present lecture. You will find it easy to remain alert. You will find it easy to exit from that lecture in a good position to study its contents properly before the next time that the class will meet. If you walk into a lecture with, at most, a vague and scattered knowledge of the preceding lecture, then you will not understand what is being said. Don’t blame your instructor. It’s your fault. You will exit the lecture with virtually no knowledge of what was done there. You will find it difficult and painful to attempt to study the lecture notes. You will be tempted to avoid studying the material altogether and, instead, look for some ways to remember “what he wants” with those homework problems.

Do that and you are on the road to failure.

Coming to Every Lecture
Attending class is an absolute must. Do not schedule other appointments during your lecture time. You must be in the lecture, both in body and spirit for every minute of every meeting of the class. If you are prevented by illness from attending a lecture, look upon that event as a potential disaster in your life; something that requires urgent and intense action in order to mitigate the damage that your absence has caused.

If you miss a class, do not make the tragic error of asking what homework problems were assigned on that day. Ask, instead, for a copy of the lecture notes. Get a good, readable and reliable copy and work through it carefully and diligently until you have caught up on the material. **You have caught up when you know what all of the words mean, understand how the problems there are solved and can reproduce the material of those notes closed book.**

Working with a Group
**Beware of group work!** It can be dangerous. Although group work can sometimes provide a helpful environment for learning, it should be the start of the study process, not completing of it. If one member of a group is dominant and does most of the talking then that one person will do most of the learning. So, if you work in a group, make sure you do the talking; at least some of the time. Then leave the group and do the work again alone closed book to make sure that you know it. **You do not know the material until you are able to write it down on your own with the book closed.**

Avoiding a Double Standard
Remember that, in an examination, you are expected to work closed book and it is you alone who does the talking. Don’t impose a double standard upon yourself. If you decide, with the notes open in front of you that it “looks all right”, then,
when you have to produce the material on your own, closed book, in an actual examination, of course, you won’t cope. A common complain we hear from students is: “I studied all of this stuff and I knew it when I was at home but here in the exam I blanked out.” You should understand that, in the history of the world, no one has ever “blanked out”. If you can’t answer examination questions, then there is only one reason why: You don’t know the material.

When you are studying, measure your progress under the same closed book conditions that you will face in an examination. Simulate closed book examination conditions and write out the material. Then look at what you have written. If you are proud of what you see, if you feel you could do an excellent job of explaining it to others, then you have studied the material.

**Writing What you Want to Say, Not what you Think the Instructor Wants to See**

In assessing whether or not you understand the material, never be willing to write something merely because you believe that this is what the instructor did in class and that, consequently, this is what the instructor “will want” in the exam. Make sure that everything you write is being written because you want to write it; because you understand why it should be there. Don’t write what you think the instructor wants to see. Write what you want to say. One of the most common symptoms of student failure is the expressed desire to find what the instructor wants in tests and examinations.

**Study for the Course, Not for the Tests**

The thrust of your study should not be directed at the midterm tests and examination. It should be directed at your need to enter each lecture prepared for it. Just as you have an obligation to be in control of the material of earlier courses when you are studying your present course, you have an equal obligation to know the material of earlier lectures in order to attend your present lecture. Unlike a typical science or mathematics class given in a high school, a university lecture will always cover new ground. Each lecture will be given under the assumption that you have studied the preceding lecture and that you know the material. If special words or phrases were introduced in that earlier lecture, then you will be expected to know what they mean. If you don’t take the trouble to know what the words mean, then nothing you do with them will make any sense.

**Combining Study of the Material with Study of How to Express Yourself**

When you are studying the material that you received in lectures, you are studying both the working steps needed to solve each problem, and also the correct way to lay out your solution in meaningful and readable language and notation. You can expect the presentation of each solution as given by your instructor to be in precise and meaningful language and you should strive to match that precision. Remember that there is no point in writing anything down unless that thing can be read. Apply the same standards at all times. Something you write down on a scrap of paper that will be consigned to the recycling bin should be written as
carefully and fully as anything you are submitting to an examiner for a course grade.
As you can see from what you have read in this document, we offer you no instant gratification. We know of no short cuts. We know of no path to success other than dedicated and diligent hard work and a desire to succeed.

Perhaps, if all of the message of this document is to be summed up into a single statement, then that statement should be that you can succeed if you really want to succeed; but you have to be serious about that wanting.

If you work correctly, then you will find that the demands made upon you by your studies will not require you to be a genius. In fact, many of the most successful students are people who have reason to believe that they are not at the top of the heap when it comes to talent or intelligence. There is something else that matters much more: the will to succeed and the willingness to do what it takes to reach that goal. If you work for success and care about yourself, then you will make it easy for us in the university to care about you, and to work with you to help you succeed with your quest.