

The Nitty-Gritty of Effective Studying

Some General Suggestions

1. ***Each night before you go to sleep make out a list of things you want to accomplish the next day.*** Make these things specific, but be realistic. Don't list 10 things when you know darn well that you can accomplish only four of them.

2. ***Find a quiet place to study.*** This will rarely be your room. Try the library, one of the lecture rooms, a study room, etc. Study for an hour to an hour and a half at a time, without interruption. Then take a 10 minute break; perhaps grab a cup of coffee, take a short walk, or agree to meet a friend for a brief talk. Then back to work. Before you start your studying decide what you hope to accomplish (actually you should have done that the night before). Will you read a chapter of chemistry, will you rewrite your lecture notes, what? Try to work until you have accomplished these objectives or until you are definitely tired.

3. ***Make good use of your free time during the day.*** A lot of studying can be accomplished during the day, even if you are a science major and have one or more laboratories. Consider the following breakdown of a typical day for a person with four courses and one four hour lab each week. Each week this person has 16 hours of class time; for a five day week this averages to 3.2 hours of class time per day. Now assume that you spend two hours during the day at breakfast, lunch, and dinner, two hours per day involved in a sport or other activity, an hour per day showering, cleaning your room (yeah, right!?) and so on, an hour per day socializing, and seven hours sleeping.

There is, therefore $24 - 16 = 8$ hours per day on the average remaining for your academic pursuits; i.e., studying. Notice that this should be ample time to do all the work necessary for four courses including one with a laboratory in a five day week! You will probably want to do some studying during the weekend, but you will also want to save some time for relaxation, parties, and other activities.

4. ***Try very hard to study consistently and to keep up with the work in each class.*** This is one of the most important things you can do. Sure, its not easy to resist the temptation to sit around in a friend's room discussing things or playing computer games. Heck, everyone has trouble saying no to a group of friends going to a frat party or a movie. Moreover, you don't have to become a Trappist Monk; just develop sufficient discipline to spend a significant amount of time on your studies each day and avoid the temptation to spend a whole evening socializing.

It is difficult to over emphasize the importance of discipline and consistency. Consider the student who decides to party several nights in a row, then skips class the next day because he is not feeling well (I guess we know why, eh!) and then decides to go to bed early. He has now missed three nights of studying and a day of classes. In the meantime, new material has been presented, including material that is not in the textbook. Thus, on the fourth day, he must obtain the notes from the four classes he missed the one day, and do all of the work that he should have done the previous three days. Obviously, he will not be able to do that, and so on the fifth day he is almost a week behind in his work. At this point he must decide whether to just ignore this material or spend all of Saturday and Sunday doing the work. If he decides to ignore the material, there will be a significant amount of material that he does not know when the next hour exam comes around (in chemistry there are generally three to four hour exams per semester, which means that about every four weeks there is an exam). In fact, assuming that he has missed a week's worth of material and that this material makes up about 25% of the next hour exam, he will probably not be able to get higher than a 75 on the next hour exam. Worse yet, in the sciences the information is cumulative; that is, mastery of a topic often depends on an understanding of the material that has been covered before. Thus, he will not have a complete understanding of the rest of the material covered on the hour exam (not to mention the remainder of the exams in the course, including the final exam, which is also cumulative) and will therefore barely be able to pass the next exam.

If on the other hand our student is sufficiently motivated to spend the entire weekend catching up, he may be able to learn the material and do reasonably well on the next exam, but, this material has been crammed in during two days. We hear you thinking, "so what?" It is almost always true that difficult material is learned more easily and retained more easily (and longer) when there is a longer time for the digestion of that material. It seems to take time for the brain to wrestle with the concepts, even when you are not consciously thinking about them.

Notice also that our student has had to rely on the notes taken by four other people in the classes that he missed. Not only are many students poor note-takers, their notes may be very difficult to decipher.

5. ***Be sure to get some exercise and find some quiet time for yourself each day.*** Although we realize that it is unnecessary to remind most students to exercise, there are people who become so engrossed in their

studies (yeah, it's hard to imagine!) and/or extracurricular activities (student newspaper, etc) that they get very little exercise. The exercise can be as simple as a 20 minute brisk walk and it will help to reduce stress.

The idea of some quiet time is totally foreign to some people, but we think that this also can be very effective. You can use this time to plan your next days activities, let your mind wander over a difficult problem, but, most importantly, force yourself to spend some of that time thinking over the material you have studied that day. Some people like to combine exercise such as walking with the quiet time. As we have mentioned before, the quiet time is particularly effective immediately before you fall asleep.

The Study Routine

1. ***Use your textbook to read about the material that will be covered in the next lecture.*** In this reading you should be certain that you know all of the terms and make some notes in the margins about the meaning of each paragraph or section. Use the syllabus for the course to keep track of exactly where the instructor is in the material.

2. ***Go to the lecture with the intention of learning as much as possible.*** This means go to every lecture; to exaggerate only a little, only a death, your own, should keep you from the lecture. Be certain that you are awake and ready to take notes and listen intently.

3. ***Take the very best notes possible during the lecture.*** Take down not only what is written on the board, but also as much as possible of what is said. If the professor uses a hand-out, take notes about it in the margins. Also develop (it will take time) the ability to listen and understand while you are taking notes. The fact that you have already read about the material will definitely help you to understand what is going on in class. Develop your own system of shorthand to make note-taking easier. If the professor asks questions try to answer each one, if only to yourself. Compare your answer with the other students' answers and the correct answer.

4. ***As soon after the lecture as possible (the next period if possible), rewrite your notes.*** During this process be certain that you understand them, that you can do the examples, and that you understand all of the ideas.

5. ***Reread the section of the textbook that covered the lecture you have just heard.*** This will be the second time you have read the material. This time you should do all of the practice examples without looking at the solutions. You may also want to outline the material you have just read (this should not take more than 10 or 15 minutes because you are not dealing with a large amount of material).

6. ***Study your notes*** by rereading them and then try to make up your own examples following closely the examples and problems given by the instructor.

7. ***Do the problem sets and/or problems at the end of the chapter.*** This step is particularly important because it is the ultimate test of whether you know the material. Expect to spend a good bit of time on problem solving and do not give up on any problem until you are driven to the point of exasperation. Just before you are ready to give up on a problem, go back and reread the pertinent material in both your textbook and your notes, and then try the problem again. Always ask: What is given, what concept or model or idea is involved, what must be determined? When you do the problems try whenever possible to visualize the process. We believe that this is an important step in solving many problems.

8. ***After you have given the problems a very serious effort, check the answers.*** Do not use the answers or solutions to the problems as a crutch to figuring out how to do the problems. Also do not fool yourself into believing that you know how to solve a particular type of problem by simply reading the solution.

9. ***If you have trouble doing the problems, go to see the instructor.*** You will also need to do additional problems. Most textbooks have many examples of different types of problems. Do as many problems as possible.

10. ***Each night review the material you have learned that day. Every week take time to go back and review the material you have learned that week.*** During a walk or other quiet time, think through the material in outline style. What are the major topics? What models or concepts are involved in these topics? What is the step by step procedure for applying a given model? How does one topic relate to the others?

Before the Exam

1. ***About three days before the exam begin to reread your notes and the outlines of the text that you have made.***
2. ***Redo some of the problems in the problem sets, particularly ones that have given you problems.***
3. ***If the instructor has a review session or problem session before the exam pay very close attention.***

Most instructors go through problems that they feel are particularly important and will even at times do problems that are identical to those that will be on an exam. Make certain that you know exactly what material will be covered on the exam.

4. ***If exams are available that the instructor has given in the same class during previous years, do the problems on the exam.*** They will be good practice and give you some idea of the style or type of problem that the instructor gives.
5. ***Do not get less sleep than you normally do the two nights before the exam.***
6. ***On the day of the exam make certain that you are awake (your body and mind require a couple of hours to fully wake up) and ready to take the exam.*** Make certain you have your calculator (does it work?), several sharpened pencils and a pen, and any other materials (data tables, for example) that you might need.

During the Exam

1. ***When you get the exam, begin immediately with the first problem.*** We do not think that it is a good idea to take a few minutes to peruse the exam to find out how much time to spend on each problem, etc. In our experience, what this generally does is frighten the student who sees a problem that looks intimidating, and does not really provide any guidance for the pace at which to proceed. In other words, just dive in.

2. ***Do each problem carefully, but do not spend an inordinate amount of time on any problem.***
3. ***When you have finished a problem, take a few seconds to ask, "Does this answer make sense? Are the units correct?"***
4. ***As you do each problem put a check mark alongside the ones that you are less sure about and then when you are finished with all of the problems come back to these first and redo them.***
5. ***If there is time, try to clear your mind, and check each question. If you have lots of time, redo each of the problems.***
6. ***If you encounter a problem or question that completely stumps you, try not to panic.*** Take a deep breath, remember that your career is definitely not going to depend on any one course, let alone any one exam, and certainly, not on one question.

After the Exam

1. ***When you get the exam back, be sure to go over the problems you missed very carefully.*** If the instructor provides an answer key or solutions, go over this with a fine tooth comb. If you can not figure out why your answer is wrong, go to the instructor.
2. ***After you have gone over the exam carefully, set it aside for a couple of days and then take it out and redo it.*** Make certain that you get the correct answers.

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