Dr. Davis  Study Hints

A common problem students have with the traditional lecture-homework-exam format of instruction is that they understand the material when presented in class by the professor or by a classmate, yet come away from exams completely confused. There are as many reasons for this phenomenon as there are students. Unfortunately, there is no universal solution to this problem that is applicable to each individual student. However, I have noticed over the years one common practice among my students that often contributes significantly to poor comprehension and weak problem solving skills.

Students enjoy working on homework assignments in groups. Indeed, we generally encourage this as one form of study. A typical study group consists of one or two advanced students and at least the same number of students who feel lost in the course. Ask yourself which one of these categories you fall into.

The advanced student comes to class or a study group having read the assigned material in the textbook ahead of time.

takes good, organized, clear and readable notes.
participates in class discussions.
usually figures out the solution to the homework first, while the rest of the group is struggling with the problem statement.
struggles down several potential solution paths until the correct method is discovered. (90/90 Law: The first 10% of the solution takes 90% of the time. The remaining 90% takes the remaining 10%.)
explains the homework problem statement and/or solution to the rest of the class or study group.
consults the professor for advice as a last resort, or asks specific questions about the concepts behind the problem.

The lost student:

• waits until the last minute to read the book (or does not read it at all).
• frequently skips class.
• copies bad notes from a friend.
• does not make an effort to follow along during lectures.
• does not read the homework assignment ahead of the study group or before coming to class.
• participates in the study group just long enough to get the answers to the homework. (Slack's law: The least you will settle for is the most you can expect to get.)
• allows others in the group to explain the homework problems or concepts to the rest of the group.
approaches the professor for advice immediately when the first try at a solution proves unsuccessful. The typical question to the professor in this scenario is, Where do I begin? or How do I do it? when a better question may be, Where am I going wrong? or Please explain this difficult concept.

The pattern emerging from these descriptions is that students who perform well on exams have practiced solving problems, while those who do poorly have allowed others to do the work for them. There is no substitute for struggling through problems by your self. Gradually, you develop a sense for what works and what does not. But, this takes much practice. Rarely does a student come along with innate problem solving skills. A good study group consists of several students who are contributing equally (the ideal world?). Engineering is a demanding major. Time is scarce. Nevertheless, if you feel lost, force yourself into the habit of coming to your study group prepared. Look at the problems and formulate your own solutions ahead of time. When you meet with your peers, you will find that, now, you are the one explaining the problem and potential solutions to others, which only serves to reinforce the concepts in your own mind.

Communication is useful only when it is balanced by concentration; otherwise, you tend to listen too much to opposing ideas - Renzo Piano, Architect.

Creative is another adverb for problem solver. Creativity is seen to be a joining together of two or more concepts to produce a new idea or useful product - a synthesis to get something new and useful. The best way to enhance creativity is to have more ideas. If ten ideas will give one creative idea, then twenty ideas will give two creative ideas. What we need are more ideas, whether good or bad, in order to find the good ones. Try some of the suggestions below to enhance your creativity in problem solving1.

1. Have more ideas.
2. Develop ability to see or observe things in different ways. Try this exercise; identify as many uses for a common object as possible.
3. Defer judgment of ideas until they can be tried, tested and analyzed, and viewed in relationship to other ideas and concepts.
4. Seek alternative solutions. Adapt, modify, magnify, minify, substitute, rearrange, reverse, combine, ask yourself what if questions, how does nature do it?
5. Look at examples of how others approached similar problems.
6. Work problems, make up games.
7. Use the required homework format to help organize your thoughts.

Once more, THERE IS NO substitute for practice. Always work through the assigned problems! Then pick out some unassigned problems in areas you where you are having difficulties to reinforce difficult concepts or unmastered problem solving skills.

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