Rebecca Braslau: Organic Chemistry
Teaching Philosophy

I have the privilege and heavy responsibility of teaching the first quarter of Organic Chemistry (Chemistry 108A): a class that many students are obliged to take if they wish to pursue any type of biology, chemistry or medical career. Most students come to the class with trepidation, after hearing rumors of the class being extremely difficult, and that medical and pharmacy schools use this course as a "weeder class" to cull out the weaker students. I love organic chemistry: I turned to chemistry as a bio major in college, after taking one semester of organic. It is easy to convey my excitement for the subject: organic chemistry entails a new language and shorthand for being able to predict reactions using a basic understanding of orbitals and electrons (derived from the periodic table), and a pattern of reactivity called "arrow pushing." My goal in teaching is to give my students an understanding of how to "push arrows" to understand and explain reactivity, rather than memorizing a bunch of reactions. Arrow-pushing allows one to group together reactions following similar patterns, and extrapolate these to new reactions. Applications run from understanding physical properties of everyday experiences, to obtaining a glimpse as to how pharmaceutical drugs are developed, to how to "destink" your dog when she has a midnight encounter with a prowling skunk (baking soda + dishwashing liquid + hydrogen peroxide). My students gain intuition as to why is olive oil a liquid and butter a solid, how free radicals cause food and lipids in our bodies to "go rancid" (and Vitamin E and C can slow this process down by scavenging free radicals), to gaining a fundamental understanding of what are polymers.

Teaching very large classes of just short of 400 students in this arena poses additional challenges. I embrace technology to give the students tools to make access to the material easier, and to be able to accommodate variable student needs. Prior to the quarter, I create "lecture blanks": pdfs of the slides I will use during lecture containing titles, figures, and organizational hierarchies, plus review summaries at the end of each chapter. What is missing is the key content. Students are able to download and print these "lecture blanks" before the class meets, and then take notes directly on them in real time. I also print out a set of lecture blanks, and write my notes directly on them using a document camera, to ensure that everyone can see the content. Thus the students can focus on writing the main structures, while the peripheral images and subject headings are already on the paper. Hopefully this allows students to keep up in lecture, and engages them so they don't sit passively during class. I webcast ALL of my lectures. This allows students to re-watch sections that went by too quickly, were unclear, or to catch up if they miss a lecture due to illness or family emergency. I also assign handpicked problems from the textbook (I work out all of the problems in advance, and throw out the problems that strike me as busy work, memorization, or off-topic). The students have all of the answers, and are asked to self-grade their homework, yet turn it in on a rigorous schedule, in order to prod the students into keeping up with this fast-moving class.

I hold twice weekly office hours (scheduled for different times, to try to maximize availability to students with competing class schedules), and book a room where all students who show up can ask questions in a non-threatening, relaxed atmosphere. Over the years, I have consulted with my sister (a former UCSC undergrad bio/pysch major, with a Masters in Behavioral Modification – with dolphins) on how to encourage students to actually come to my office hours. I make it clear that I welcome them, work very hard at

learning the names of the students who come more than once, and thank them for coming each time. I give them my undivided attention, and assure them that not understanding the

basics is where we ALL started in studying organic chemistry. I usually have a contingent of about 30 regulars over the quarter (less than 10% of the class). There are also TA office hours, and Modified Supplemental Instruction reviews available. In addition, on the Sunday afternoons prior to each of the two midterms and the final exam, I hold a massive "Problem Solving Session" with the students. I put together several sheets of problems for the students to work out together in groups concurrently in two large rooms. I ask the TAs to attend if possible: we filter around the two rooms, and give assistance and advice to students working in groups of five people or more. This mechanism encourages students to teach each other (peer teaching), using words and explanations appropriate to those new in the field. Since there are close to 400 students, this is a very useful and empowering technique to get students to assimilate the material despite the fact that I cannot realistically work one-on-one with them. I regularly see students "get it" during these sessions, making the rest of the entire quarter (and the subsequent quarter of organic chemistry 108B) accessible, and giving the students confidence. I receive many notes from students telling me how helpful these non-review sessions are in cementing the concepts. I make all of my previous exams and answer keys available on eCommons, so that they have a very good idea of what type of exam questions I write, and what to expect. However, I never re-use my exam questions, so memorization is a waste of effort.

At the end of the quarter, I try to devote most of the last lecture to introducing the research my group is carrying out here at UCSC. I want the students to understand that professors and graduate students are engaged in meaningful and exciting research, and to suggest that those who have the time and inclination should consider getting involved in undergraduate research here at UCSC. I end the talk with pointers on how to find a research group and how to approach the professor about the possibility of doing an undergraduate research project: request to attend the professor's research group meetings (NOT necessarily mine!) and attend these, *before* discussing research openings.

Each year, I receive emails, cards and letters from students telling me that they expected to hate the class, but instead learned to love organic chemistry. Some tell me that they have aced their MCAT exams due to my teaching, and others tell me that they are changing their majors to chemistry. However most are just happy to have a basic understanding, allowing them to move forward with their original pursuits, and are thankful they didn't have to memorize vast amounts of meaningless reactions to pass my class. I hope that I have changed their attitude towards science, as organic chemistry underlies all of biology and medicine. They may not consider organic chemistry easy, but at least I have demystified the field for them.

Included is a sample of my most recent syllabus & homework assignments, including a section on "***How to Pass this Class***!".