Teaching Philosophy

Andrew J. Bonham

The chief role of a teacher is to serve as a guide towards understanding and independent learning, not to simply be a facilitator of facts. Recognition of the learning process as more than rote memorization and dry application is something that I have seen happen all too rarely in the sciences. Consequently, I have set my teaching goals and instructional style to emphasize this guiding process; I strive to make relevant lectures and discussions, give meaningful and fairly assessed student assignments, use technology effectively, establish positive interactions with students, and set professional goals for myself as an educator and guide.

My teaching approach centers around providing tools to enable independent student learning and expand worldview. The best learning occurs when an unfamiliar concept becomes part of a student's outlook, instilled as an understanding and critical awareness of a new set of investigatory tools. Accordingly, I tune lectures and activities to show that chemistry and biology are not isolated subjects, but an integral part of the world the student lives in. For instance, lectures about the complexity of genetic regulation and molecular genetics can lead to discussions about news articles on "the gene for obesity." Critical thought and evaluation of such topics are often lacking in the news media, and provide an opportunity for students to apply new concepts. When I taught General Chemistry 1C at UCSB, I applied this sentiment by following a lecture focused on abstract concepts (e.g. concepts in electronegativity and intermolecular bonding) with a lecture bridging this topic to daily life (e.g. the chemistry of taste and the mechanisms of artificial sweeteners). It is important to show students how to apply facts to relevant situations, helping them develop analytical tools of their own.

To avoid the easy trap of students passively absorbing material, lectures and assignments must pay special attention to student participation to stimulate active learning. Lectures must be interspersed with activities and dialogues that engage the students, encouraging them to actively apply the information they have learned. To this end, when I have taught Biochemistry Laboratories, for undergraduate or graduate students, I avoid writing a "cookbook" for the students to follow, but instead present a technique and then have a discussion (first in small groups, and then as a class) where we work out a reasonable experimental procedure and discuss hidden assumptions in their knowledge that may result in different choices. This pairing of lecture and discussion helps to ensure that even if not everything discussed is retained, the attitude that everything can be explained and reasoned out is absorbed. Additionally, assignments must also be geared towards active learning through, for example, having students work to solve problems together. By requiring active participation with others, the student is encouraged to understand the material sufficiently to actively contribute, as well as creatively apply his or her knowledge. While teaching Microbiology Laboratory at UCSB, I encouraged independent projects where small groups of students work to make cole slaw or kimchi in class, designing experiments and cell staining protocols to investigate the microbial processes behind pickling. Since the students design the process, they learn not only about microbiology but also about the scientific method, gaining practical experience in hypothesis testing. These assignments and discussions prevent passive learning and help students come away from the course with a new viewpoint.

To encourage student involvement, it is important to have lectures and assignments that

maximize learning but equally important, and often overlooked, is the importance of giving opportunities for early and often feedback for students. While this increases the workload for both writing and grading assignments, the rewards in terms of student comprehension and advancement are great. Students become more involved in, and concerned with, a course when they can easily track their improvement. To this end, courses should offer students clear grading policies (e.g., rubrics) and students should get consistent feedback. No one likes receiving a poor grade, but early failure can be provide the impetus for a change in attitude or behavior that's needed to succeed. When I have taught Biochemistry Laboratory at UCSB, I have used both weekly quizzes and challenge problems discussed in class as ways of letting students immediately know how they are performing individually and in relation to their classmates, as well as alerting me to subject areas that may need more attention.

The effective use of technology is no longer a new issue, but an integral part of the teaching experience. As a self-taught network, programming, and computer technician well-versed in Linux, Unix, Windows, and Mac OS, I have often made great use of implementing technology-based components in classes I teach. To this end, I utilized a trial system for UCSB when I taught General Chemistry 1C where the students were able to do homework assignments entirely online and with instant feedback. Such tools have now been standardized at UCSB; I have used their Moodle system, as well as social sites such as Facebook, to interact with and guide students in my courses. In lecture, I alternate between Power Point slides, which can very easily show complex schema and images, and writing on the board, which allows students to see and more easily participate in the thought process. I am also a proponent of in-class demonstrations, webinars, and interactive computer models as ways for students to get additional hands-on experience.

Similarly, forming an effective bridge of interaction with students is an important way of encouraging interest and enthusiasm, and I strive to make myself accessible, approachable, and available to my students. This includes emphasizing and encouraging visits to my office hours, being readily available over email and web forums, always keeping in mind the students' point of view. When teaching laboratory courses, many students have come to me for advice from other laboratory sections, and evaluations and comments from my students show that they regard me as a very enthusiastic and approachable educator.

Although my teaching experiences thus far have left me a capable and prepared educator, I strive to always improve, learning and incorporating new techniques and attitudes into my teaching. My belief that the best teaching involves a shift in worldview motivates one of my long-term goals, which is to organize and teach a course on the "Chemistry of Everyday Life", either as an elective or as an alternative approach to the general chemistry prerequisite for many undergraduates. This course would strive to teach all the essential methods and concepts of chemistry, but with an emphasis on investigating daily life (e.g., dish-washing, bleach, rust, food and food additives, garbage and decay, etc). Additionally, I have worked to stay current with new thought in educational techniques through participation as a facilitator for new teaching associates in the Summer Teaching Institute for Associates program at UCSB, and would look forward to similar pedagogical experiences in the future. I constantly strive to fully implement my teaching strategies to encourage student interest, understanding, and ultimately the development of tools to look at the world around them in a new, scientific way.