Teaching Philosophy

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To me, learning is analogous to the ways in which the nervous system processes sensory information. First, peripheral nerves detect sensory signals of all types; similarly, students are presented with what may seem like an incomprehensible amount of material in the form of audible lectures, PowerPoint presentations, and textbook readings amongst others. In the nervous system, signals from peripheral nerves are sent to the spinal cord where different types of information from nearby parts of the body start to converge; similarly, students start to link related concepts after being repeatedly exposed to the material. Finally, information from the spinal cord is sent to the brain where basic signals are associated with more complex cognitive functions like emotions, context, and anticipation; likewise, once students are able to associate basic facts with previous knowledge, they can apply what they have learned and logically think through theoretical situations. As a teacher, I attempt to engage this system in students by presenting basic subject material in a concise, organized fashion, and then challenging students to apply this new knowledge when solving complex problems.

Classroom. I have taught in various formalized classroom and laboratory settings for ten years. My first teaching experiences were in graduate school where I served as a Teaching Assistant for various biology laboratory courses. As a senior graduate student and junior postdoctoral fellow, I was invited to guest lecture in undergraduate neuroscience courses, and now, as a senior postdoctoral fellow, I lecture in graduate and medical student courses, direct a graduate student journal club, and have worked as an adjunct professor at an undergraduate college. While my overarching teaching philosophy has not changed over the years, I have tailored the ways in which I apply this strategy to better suit the needs of a particular group of students or a particular course.

In all courses and guest lectures, I provide students with a *detailed, organized outline* for each class meeting. This document combines information from the textbook or other required readings and serves as the framework for accompanying PowerPoint presentations, in class activities, or homework assignments. Students are encouraged to review these outlines before coming to class and to amend the documents with their own notes during class to increase concept comprehension. In my undergraduate "Introduction to Behavioral Neuroscience" course, these pre-work outline reviews were practice for *flipped classroom exercises* that I implemented later in the semester. As an adjunct instructor, I developed two flipped classroom exercises: one on basic neuroanatomy and another on basic neuropharmacology. Prior to attending these sessions, students received a prework assignment that required them to research very basic questions (*e.g.,* matching common ligand/receptor combinations, fill in the basic function of select brain regions chart). In class, students used these assignments and worked in groups to answer problem-based learning questions. For instance, in the neuroanatomy session, students were given case studies and asked to "diagnose" the underlying pathology; in the neuropharmacology session, students combined their basic knowledge of biochemistry and electrophysiology to predict what effect a given drug would have on a neuron. In addition to flipped classroom exercises, I also utilize *hands-on activities* to demonstrate the "real-world" relevance of textbook concepts (*e.g.,* mapping our somatosensory cortex homunculus with two-point discrimination experiments). One former student specifically commented on these activities in their end of the course evaluation stating, "I enjoyed the in-class activities…I thought they were great ways to have us get to know the material and see how it relates to the real world." By combining these activities with didactic lectures, I aim to present course material in a wide range of modalities that can resonate with all learning styles.

To prepare students for careers in science, I often extend beyond information from our textbook and *utilize primary literature articles* to connect what students are learning in class with cutting-edge research. For example, in my graduate course guest lectures on emotional processing, I discuss a published paper in which scientists used visible light to turn anxiety on or off in mice. This paper allows me to review basic neurophysiology, neuroanatomy of the limbic system, and novel research techniques, all of which had been previously covered in different capacities. Linking abstract ideas to real-world applications makes students more enthusiastic about the course materials and in the past, has spurred follow-up conversations about the principals of drug development. I give the same article to students in my undergraduate course but use it to teach the basic principles of peer review and publishing in addition to the scientific content of the manuscript. Undergraduates are assigned reading guides for each section of the paper, the answers to which are discussed as a class before the next section is assigned. By breaking papers down into "digestible" pieces, students are able to build their confidence, increase topic comprehension, and learn how to successfully navigate scientific journal articles.

I strive to make my classroom a relaxed, supportive environment in which students feel comfortable pushing the limits of their understanding. To this end, I make all *exams take-home* when class size permits (*i.e.,* <50 students). All exam questions are open-ended essays that require students to have a working understanding of a basic biological concept. While

these types of questions require more time for thoughtful development and grading, I strongly believe that they encourage creative problem solving and knowledge application from students. Student reviews of this practice have been overwhelmingly positive; anonymous student reviews stated "The exams were formatted the best out of any class I have ever taken and I felt like I learned more than I have in any other class because of that formatting," and "I loved the take-home exams – very low stress but still very effective at allowing students to show what they know!". I also utilize online learning management systems to *regularly solicit material and instructor feedback* from students in an anonymous, low-stress manner. In the past, I have required students to ask a follow-up question or request clarification on a topic discussed in the most recent class session. This low-pressure activity allows me to identify topics that need to be reviewed in the next class meeting and allows students to ask "risky" questions without the potential embarrassment or fear some students can feel when asking a question in front of their peers. I constantly encourage students to ask questions in class; I model this behavior by asking students or guest lecturers questions when they are presenting to our class. Based on former student reviews, I believe that I have been successful in fostering comfortable learning environments. Anonymous students have stated that I am, "Approachable. I don't feel stupid when I ask her questions," and "She spoke to us like we were people with meaning." I believe that students can reach their peak academic potential in these types of environments.

Research laboratory. I believe that I play a very large role in setting up students for successful, productive research careers in my laboratory. When an undergraduate student first joins my lab, I provide each student with a basic introduction to the scientific question they'll be answering and the techniques they'll use to answer that question. For example, I created a PowerPoint presentation that covers the basic theory and practice of immunohistochemistry, a common technique used in my research that allows experimenters to visualize specific proteins within a tissue or cell. Similarly, I created a one-page primer on common statistical tests used in the lab to assist students in determining which analysis is the correct one to use on their data set. I also provide students with a few of the most relevant primary literature articles for their specific project and an introduction on how to search for papers in popular scientific publication databases like PubMed and Google Scholar. I then encourage students to independently find additional articles that supplement the basics I provided for them. Instead of providing graduate students with these materials, these individuals and I have detailed conversation about hypothesis development, experimental design, technique trouble shooting, and data analysis in order to assess their level of understanding. These conversations often highlight areas that require follow-up research on the part of the student (*e.g.,* Google or PubMed searches, consulting their lab mates, etc.).

Once students are comfortable in their project, I formally meet with them once a week to review their progress and casually check in with them whenever they are in lab. In our weekly meetings, I pose challenging questions to my mentees such as: why did you get this result? What follow-up experiments do you want to perform? Are you missing any critical controls? These questions prepare students to answer similar inquiries that are posed when they present their research during lab meeting or during poster symposia.

Final thoughts. I am constantly working to improve the material and instruction in my classes; nothing is more frustrating to me than a science course that has not been updated in the last three decades, despite the advances made in that field during that time. My teaching strategies are constantly evolving to suit the particular needs of a class or mentee. Nothing gives me more pleasure than helping a student learn. During one specific tutoring session in my sophomore year of undergrad, I was explaining how the lac operon, a functional DNA unit in bacteria, worked to a struggling genetics student when I realized I wanted to dedicate my career to helping others learn. I had never felt a rush of emotions (pride, satisfaction, enjoyment, and eagerness) from helping a near stranger prior to that learning experience, but knew at that point that I would continue to help others in a similar capacity. I teach because I love to teach.