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Teaching Philosophy

I think the greatest gift that an educator can give their students is the tools to become independent learners and thinkers. Assimilating new material and concepts from a given course is definitely important for students to succeed in a field, but if students also discover how to learn on their own – through answering *and asking* the right questions – then they will be well-positioned to be successful at whatever they pursue. To help today's students become tomorrow's leaders by making educated decisions in their careers as well as their daily lives, my teaching philosophy incorporates the following approaches: understand a student's background, help students see the bigger picture, actively engage students with the material, and utilize technology inside of and outside of the classroom.

Understand a student's background: A student is never a blank slate. Every student that enters a university classroom brings with them a different background, different experiences, and different preconceptions (whether right or wrong). I take all of these factors into consideration when teaching the exact same material to a classroom full of diverse students. Being aware of a student's background is usually even more important when they seek one-on-one help. Is the student just not getting a new concept that was recently introduced in lecture, or is there a more deep-seated confusion? If it's the latter situation, the misunderstanding needs to be rooted out and resolved before a student has a solid foundation on which they can build new, related material on top of.

As a scientist and educator for Science Buddies, I was continually challenged to develop accessible scientific content for the entire K-12 range, which honed my skill at ensuring that the concepts, terminology, and language I use are an appropriate fit for my audience. I applied this skill in the university classroom setting when I taught General Biology I Lecture and Laboratory (BIO 1080 and 1081) at the Metropolitan State University of Denver (MSU Denver) to help students from all different backgrounds succeed. Based on my evaluations, the students were aware of, and greatly appreciated, my efforts; students noted that I "would answer any questions," am "very helpful when questions are asked," and "make sure everyone understands the material before moving on to new things." By figuring out where a student is coming from, I strive to make new material correctly fit into, and ultimately expand, their worldview.

Help students see the bigger picture: Increasing students' worldviews ties closely into one of my key roles as an educator – facilitating big-picture thinking. It can be all too easy to get lost amid details, being unable to see the forest when surrounded by unfamiliar trees. For courses related to molecular and cellular biology this can be a particular challenge – there are numerous facts that students must know to succeed in these classes, and it's much easier for them to master the material when they make connections that tie it all together. This includes making connections between different classes, and between classes and their daily life.

As an instructor at MSU Denver, I greatly enjoyed teaching General Biology I Lecture because of the many opportunities to help students connect the dots. For example, when delving into photosynthesis and later into cellular respiration, I repeatedly would have students step back and ask them to consider how these processes are interdependent and functionally similar. What products do plants make that are important for our survival? How is H_2O consumed in photosynthesis, and how is this similar to the way in which O_2 is used in cellular respiration? Stepping back further – why does organized life on earth not disobey the second law of thermodynamics? At the beginning of the semester, most students do not realize that the sun is our ultimate energy source, and the answer to this physics-related question. Similarly, I try to bring my own research interests and experiences into the classroom as much as possible, demonstrating how what they learn in lecture is relevant to real laboratory research (and it is no surprise that students are usually unequivocally thrilled to hear about cutting-edge research related to genetics and stem cells). Making connections between topics that may seem unrelated at first glance, such as molecular plant biology and physics, not only helps students retain new material (and reinforce old concepts), but it also helps them develop a better understanding of the world around them as a whole. And it encourages them to learn more outside of the classroom.

Actively engage students with the material: As an educator, I know it can be all too easy to slip into the routine of lecturing at students and expecting them to regurgitate the facts when test time arrives. We're busy people, and it can be challenging to come up with an engaging lesson plan, but this is something that students direly need (especially in our modern world full of distractions and multitasking). To engage students, when teaching General Biology I Lecture at MSU Denver, I often had students break out into small groups to discuss challenging questions, then share their answer once a consensus was reached. This approach also helps students self-identify misconceptions.

As another example of inciting active learning, I have given lectures on how to write a good grant proposal (at the University of California, Santa Barbara [UCSB] and the University of Colorado Denver Anschutz Medical Campus), and in these lectures I teach proposal-writing skills by asking students questions: What is an area of research they find interesting that has unanswered questions in it? How can they narrow down the questions so that they fit within the feasible scope of a proposal? What laboratory or bioinformatics tools would they use to answer their question, what obstacles might they encounter, and how could they overcome them? Asking students to consider these questions, instead of simply telling them how to write a proposal, helps them think more about the proposal-writing process in a logical way and consequently better internalize it. As a recipient of UCSB's ScienceLine Outstanding Answerer Award in Life Sciences (ScienceLine is a program that allows UCSB scientists to answer questions from K-12 students), and as a former educator/scientist for Science Buddies, I know how important it is to encourage students to ask questions, but as the students get older, they become more reluctant to ask questions. Creating a collegial, positive classroom environment is key to fostering good student discussion. And such discussions are also essential for an instructor to know whether students are mastering the material, or whether it's time to use an alternative approach.

Utilize technology inside of and outside of the classroom: Last, but far from least, is the increasing role that technology should be playing in the classroom. Today, more students than ever enter the classroom having been raised using technological devices on a daily basis, from iPads to cell phone apps and all different forms of social media, such as Facebook, Pinterest, and Instagram. Rather than shun them, these tools need to be embraced in the classroom where possible to help students better engage with the material.

In 2004, as an undergraduate learning assistant for Developmental Biology (MCDB 4650) at University of Colorado Boulder (CU-Boulder), I had early exposure to iClickers and other technological tools for classes, such as holding virtual office hours. Since then, I've remained interested in how technology can be used to improve scientific learning, which has led me to generate webpages, videos, interactive webinars, and other media formats as a scientist/educator for Science Buddies, as well as create multiple educational science blogs and e-books in my spare time. I've also attended the Colorado Learning and Teaching with Technology (COLTT) Conference at CU-Boulder, which helped me better understand cutting-edge efforts in using tech to enhance the undergraduate learning experience, such as the "flipped classroom," unflipping the "flipped" classroom, and similar approaches.

I think it's important to encourage technology in the classroom to also teach students how to filter the torrent of information online – now more than ever before, students must not only be able to find the information they need, but to critically evaluate it as well. This is why part of an assignment I gave in my General Biology I Lecture was to pick a peer-reviewed scientific article, find an article written for the lay audience that discussed the peer-reviewed article, and then critique how well the lay article represented the peer-reviewed article.

In conclusion: Overall, by actively engaging students in the classroom through discussion, questions, and making connections to other parts of their life, and utilizing technology to enhance the learning experience, it should lead to students not only succeeding in the classroom, but also succeeding more in life as a whole. These approaches are aimed at giving students the tools they need to continue learning and growing outside of the classroom, allowing them to make thoughtful, rational decisions about their career and other aspects of their life, so that they can become, in turn, future leaders, educators, and spreaders of the critical thinking process.

Research students: In addition to my teaching experiences in the classroom, I have also had the pleasure of mentoring several students on their own research projects in the laboratory. I am proud to share that two of my many former undergraduate research students (from my time as a graduate student at UCSB), Liane Miller and Lauren Doss, are attending the UC San Francisco School of Medicine. More recently, as a postdoctoral fellow at Anschutz, I have mentored multiple graduate students (in Masters, MD/PhD, and PhD programs on campus) and due to my mentoring relationship with one of these students, I received the UCD Graduate School's Peer Mentor Award. Additionally, I have mentored three cardiology medical fellows from Italy; these individuals had extensive clinical backgrounds with essentially no prior experience in a research laboratory, but by the end of their three months of training each could independently and successfully perform PCR, run an agarose gel, purify patient DNA, and interpret their sequencing results. I have greatly enjoyed helping them each to learn and grow.