Teaching Philosophy

The goal of translating is to convey information accurately. Having grown up in Mexico in a home in which both English and Spanish were spoken, translating back and forth became a fluid process that now happens almost unconsciously. As a scientist writing for different audiences, I seek to "translate" facts and findings to a form that is more easily interpretable for a lay audience. Similarly, I first approached teaching as a form of translating: my goal was to present knowledge in a way that students would be able to understand. However, I learned that the student is the one who has to find meaning and make associations. A teacher who simply translates knowledge is forcing a version of the material onto his pupils and not *providing* them with the opportunity to discover, connect, and think critically and creatively. My role is to combine the following elements to create a learning environment that fosters these opportunities.

Providing scaffolded structure for self-directed learning. The content of my courses follows the key learning outcomes for each session. I ask myself *what* my students should be able to accomplish as molecular biologists and *how* I can measure the degree to which their attempts are successful. I believe that the learning outcomes for my courses should not focus exclusively on including higher-order Bloom's levels; I also hold my students and myself accountable to a high-standard of metacognition and prompt students to question and reflect on the meaning of the knowledge discussed. The goal is for students to dive deeper into the knowledge by providing critical and creative explanations of phenomena and connecting concepts to applications. In my quickly evolving discipline, the challenge of the teaching-learning process is to arm students with the skills to teach themselves the new techniques and to critically assess research findings.

By making the learning outcomes explicit on the course syllabus, lecture notes, and assignments, I hold my students accountable for the skills and knowledge they should be able to master. The content I provide is scaffolded by focusing on learning key concepts that will allow participants to further develop their skills and confidence. By providing problem sets and opportunities to practice, students gradually develop mastery of core molecular biology concepts and laboratory skills that then permit the design and evaluation of different strategies. Scaffolding is gradually removed as students become self-directed learners. The learning outcomes for each lecture thus become the backbone of the course, a self-assessment for course participants, and an authentic skillset that a molecular biologist needs.

Facilitating active learning and the effective use of technology. I avoid passive acquisition of knowledge through lecturing alone. Instead, I infuse the courses I teach with opportunities for participants to interact with the material by providing hands-on experiments and realistic case studies. The material provided in class is reinforced by exercises in the laboratory and on the computer. For example, we investigate actual sequence data together to not only understand the biological phenomena but the *process* of analyzing complex data and documenting the findings. I only incorporate activities that foster thinking, provide practice, and meet the learning outcomes. Group work plays an integral part in this, for students learn valuable teamwork skills while practicing how to communicate their interpretations of the concepts to others. I frequently use final group presentations that require background research, explicitly present the thought

process, and emphasize the broader (social, legal, and ethical) implications of the work performed.

The technology I use in the classroom and laboratory has the purpose of facilitating an interactive discussion of the topics. However, the process of understanding the concepts and procedures is **not** dependent on the technology; technology assists by making the learning process visible and allowing us to gauge the progress of participants. For example, I use "clickers" to allow participants to anonymously self-assess their progress and review concepts without the fear that their performance will affect their grades.

Making thinking visible. To foster meaningful learning, I ask my students to document the process they used to reach a conclusion. I use concept maps and flowcharts in my lectures to appeal to the visual and sequential learners. I then include tasks that require graphically summarizing a process or complex ethical dilemma. I combine this method with the use of reflective writing to prompt students to *explain their thinking to the reader* and describe sources of confusion or lingering questions. I have implemented this method for the bioinformatics component of the half-semester metagenomics course I designed and have also published on its use in a bioethics activity I created for upperclassmen and graduate students.

Assessing learning goals. While a nod or a confused look may provide insight into whether the class is reaching the established learning goals, I believe that formative low- or no-stakes assessments throughout the course are essential to measuring student learning. I assign short reflective writing activities for students to describe what they have learned and how they think it applies to the course and their careers. Student feedback is critical in determining the efficacy of the activities and methods I use, and I invite students to answer mid- and end-of-semester anonymous surveys in addition to having an on-going suggestion box. I aim to make the necessary changes to promote meaningful learning and to be transparent in showing participants *why* we implement certain policies and activities.

Creating an inclusive learning environment. To make the learning process truly dynamic and productive for all, I encourage students to freely question and communicate alternatives during class, in the lab, and online. I strive to create a learning environment that values the diversity of the student body and their different majors, career goals, and life experiences. Furthermore, I am aware of those with disabilities – even invisible disabilities – and offer an inviting and accommodating experience that is fair for all participants. For this, I have attended workshops and implemented suggestions to incorporate concepts of universal design. Teaching with empathy reminds me that I was once a student with limited time and attention, and I have to make every effort to effectively engage and promote interest in and learning of the material.

Through workshops, research, and discussions with colleagues, I've learned that teaching is much more complex than the content we want our students to learn. I'm invested in becoming a better educator by learning about different teaching methods and continuously assessing and improving my own teaching and sharing with others what has worked in my classes and laboratories. I have learned that my role as a teacher is to combine learning, mentoring, and even translating, for a true reflective teacher is able to translate what worked in his/her course so that it can be implemented effectively by other teachers and students.