TEACHING DOSSIER/PHILOSOPHY

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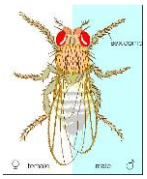

My teaching philosophy is a work in progress under continuous reflection and redesigning in alignment with an active-learning approach to promote accessibility. I enjoy facilitating learning so that I can connect with amazing young people and share my love of biology. Each new course that I design and facilitate has challenged me to reexamine my role as an educator. Reflecting on my teaching skills has made me realize that this is a work in progress because this is how we improve as educators. I focus on best practices that include regular communication, getting to know my students, obtaining regular feedback, being available and accessible and using relatable and engaging content to show that I care. I recently improved my instructional design methods in my virtual courses by taking a backward design approach. I followed a deliberate process of incorporating a strong community of inquiry, Universal Design for Learning and scaffolding to provide students with multiple opportunities to reflect on their learning. I am currently exploring new ways to use inclusive/interactive technology to design alternative assessments that can be used in both F2F and remote/distance education courses. I hope the following more detailed descriptions provide some insight into what motivates my teaching and how I've learned the importance of student-teacher relationship, particularly in virtual/remote delivery.

***We learn by doing*—**When I want to learn something that I had no idea about, I need to break it down into simple parts first. I then need to familiarize myself with those parts, learn how they work together and then put them back together on my own. This can be challenging if I am not provided with all the parts or with broken parts. Will I remember what these parts are the next time? Why do I care about putting these parts back together anyway? The content that I deliver to my students must be clear so that they can acquire the knowledge and develop new skills based on that knowledge. Most importantly, they must commit this new knowledge to long-term memory if they want to acquire this new skill.

Students must have the opportunity to break down, apply and practice what they've learned in a context that is relevant to themselves and their lives. A recent large-scale, curriculum-wide study shows that small changes can produce big gains (Weir et al., 2019). The small change is using low-tech group worksheets combined with valuable and timely feedback, and the big gain is that this helps students to achieve the learning objectives in undergraduate science. I combine case studies with group worksheets (f2f/virtual) and/or role play (f2f) to provide students the opportunity to break down subjects and ensure that topics are delivered in a meaningful and lasting manner.

I use evidence-based active-learning exercises that will develop students' skills in experimental analysis and design whenever possible. For example, I introduced an exercise published in CourseSource that allowed students to interpret data from five different data sets and multiple experimental methodologies (Cala et al., 2018). This exercise engages students and encourages critical thinking, but it also emphasizes that each experimental methodology has its own limitations and reinforces the important aspect of repetition in experimental analysis.

***We cultivate by teaching*—**I am committed to working in and supporting an environment in which diversity, equity, gender, and human rights issues are at the forefront. Connecting with students on an academic as well as personal level has benefited my teaching practices. After a student-inspired personal discussion about sex determination, I developed a case study to promote awareness of gender, diversity and inclusion. Students must identify reversals of sex development (RSDs) by using critical thinking skills to analyze data generated by multiple experimental methodologies. The exercise allows students to relate basic biological concepts like the central dogma and the creation of genetic diversity during meiosis to gender testing in athletes. I combine this with a related Howard Hughes Medical Institute online interactive. Informal feedback from students in my

major and nonmajor biology courses reinforce the use of case studies to highlight social issues and to help biology students relate biological concepts to their own lives. My Directed Studies student recently conducted an extensive literature review to further develop this case as an active-learning lesson for both lower- and upper-level undergraduate biology courses that will be submitted for peer review to CourseSource. I am currently adapting the introductory exercise followed by the experimental analysis of solving multiple mystery sex reversal scenarios as H5P interactive e-learning exercises to use in a flipped lesson and that will be available as a resource in open education. Given the applicability of case studies across multiple educational disciplines, I hope to collaborate at the transdisciplinary level to cultivate a campus environment that embraces diversity and inclusion by combining social issues with biological knowledge.

***We learn by relating*—**I provide both science and non-science majors with every opportunity to relate biological concepts to the real-world. As coordinator of the 2nd-year cell biology labs at TRU (2019-2022), I've had the opportunity to introduce a guided-inquiry approach to the labs. This approach uses a problem scenario set in a real-world context (case study) that challenges students to use problem-solving and critical-thinking skills along with collaborative group work.

I initiated a SoTL project ('Skateboards, roundabouts and blood') and obtained an Emerging SoTL Scholars Grant (2019) to address the effectiveness of case-based laboratory investigation in promoting deep learning of ABO blood types in majors/nonmajors undergraduate biology labs. I wrote the case-based scenario involving a fictitious TRU student (Georgia) who requires a blood transfusion after a hit-and-run skateboard accident on campus. The goal was to provide students with a collaborative opportunity for independent learning in which they are engaged in evaluating data and concepts while synthesizing conclusions integrated with logical thinking to solve a crime. This case-based lab was designed in alignment with the description of scientific inquiry by the National Academy of Science (https://www.nap.edu/read/9596/chapter/3#37) in which learners will: 1) give priority to evidence in responding to questions; 2) formulate explanations from evidence; 3) connect explanations to scientific knowledge and; 4) communicate and justify their explanations. There is evidence that students learn better when talking, writing and collaborating (Quitadamo and Kurtz, 2007; Linton et al., 2014; Dolan and Collins, 2015). Therefore, the original lab was divided into two parts to provide students with the opportunity to develop their skills in blood analysis in Part 1 and then apply their knowledge to solve the crime scene in groups in Part 2. This approach also provided students with the opportunity to choose their method of investigation, solve the crime based on evidence and take ownership of their results by writing their own case study conclusion.

I investigated student perceptions of learning and the benefit of case-based laboratory investigation through a web-based survey including both Likert-type, rating and open-ended questions administered through our LMS. In the Likert-type questions, most students (95%; n=42) agreed that the story about Georgia's hit-and-run accident helped them to see the real-life value of understanding human ABO blood groups, and 91% reported that the lab was more enjoyable in this context. ALL respondents rated 'Learning subjects that have a clear meaning with life connections 'having a serious, important, or useful quality or purpose (this is real world)' and 'Learning the subject matter' as very important/important.

Preliminary qualitative evaluation of open-ended comments of what students liked about the SRB lab suggests that the crime scene investigation was helpful, including the following comments: "The fact that I was involved in the planning and problem-solving skills with the collaboration of my lab partners. That was absolutely beautiful. I did not expect that I was being part of forensic science in a lab like that. Amazing."; "I enjoyed being able to work through the crime scene and figuring out how all the evidence comes together."; "It didn't feel like a regular boring lab report. It brought in real life issues that happen outside of a lab setting. It provided insight into an important job that uses this type of science and how it is used in the approach to solve a crime."; "I liked collaborating with my group because it was useful to share information with each other." This case-based lab is now an integral part of the laboratory component in two separate courses at TRU. This type of evidence-based teaching is known to benefit both students and faculty, and it also gives students a voice in their learning.

We excite by teaching*—**I take every single opportunity to ***excite my students about what they are learning. I can easily convey this excitement because I find biology inspiring and amazing. I deliver the 'how' with the 'wow'. I instill excitement through pedagogies, relevance, enthusiasm, music and humour (I really can't help this…). I 'bring students in' and then balance the enthusiasm by delivering challenging but fair evidence-based material. My students are happier when challenged and they push me as much as I push them. I believe a happy student will learn more!