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Statement of Teaching and Training philosophy

I have thoroughly enjoyed my role as the instructor of 5 different university courses spanning Data Science, Computation and Psychology. I have gained additional experience through my volunteer work as a Software Carpentry instructor (teaching basic computer programming skills to scientists at hands-on workshops), teaching bioinformatics to graduate students at Titus Brown's Next Generation Sequencing summer course, as well as instructing workshops at the SFU Scientific Programming Study Group and UBC R Study Group. My teaching and training involvement has also gone beyond instruction in the classroom and includes curriculum development for several organizations (UBC MDS program, Software Carpentry, as well as for the SFU Scientific Programming and UBC R Study Groups) and mentorship of other teachers through my role on the Software Carpentry Mentorship Sub-committee.

As a result of my experiences, I have come to believe the most important skills that an educator should focus on cultivating in their students are: (1) critical thinking, (2) creativity, and (3) self-learning. Regardless of whether students join industry or pursue further academic training, these skills are necessary for future success. In my teaching I have implemented several strategies for the development of these skills.

First, I recognize that there are many different learning styles. Therefore, I present new concepts in more than one format so that I may reach everyone. For example, when teaching for loop in the MDS Programming for Data Science course, I provided: *(i)* a visual example, *(ii)* a verbal and written explanation, and *(iii)* take a break from instruction and ask the students to use a loop for themselves to solve a given problem. This strategy also has the advantage that the information is reinforced by different types of input.

Second, I believe that motivation is important for successful learning, as it can energize, direct, and sustain learning. One way I use motivation to enhance learning is by providing extrinsic motivators, such as a clear marking rubric on assignments and exams. Another way I effectively use motivation is to harness the intrinsic motivation of each student through assignments where the student chooses the topic themselves as long as it falls under the umbrella of the course topic. For example, in the Computation in the Physical Sciences course that I taught the students were asked to choose a topic of interest for their final project. Although the final project was not due until the end of term, the students assignments each evening throughout the course were to apply the concepts learned in class that day to the dataset they were planning to use for their final project. This kept the students genuinely engaged in the assignments, as they could easily see the practical value of each days learning as they applied it to their dataset of interest.

Third, to facilitate the development of critical thinking and creativity I like to use problem-based learning (PBL) approaches. For example, in the animal behavior course I taught, the students had difficulty critically evaluating experiments and devising new experiments to test a given hypothesis. To help them grasp this challenging but important skill, I utilized a PBL approach where I presented real experimental data that tested a hypothesis, and then had the students break into small groups to work together to answers to questions, such as “what are the weaknesses of this experimental approach?” and “what is another experiment that you could do to test the same hypothesis?”. I then asked several of the groups to present their answers to the class and we discussed which answers were correct.

My teaching reviews revealed that students found this approach helped them develop the critical thinking skills required to evaluate experimental design and the creativity to propose new ones. On the teaching evaluations, students graded whether intelligent, independent thought by students was encouraged as 4.6/5, and one student commented that, “I thoroughly enjoyed the class and learned a lot from it. The instructor encouraged participation and focused on thinking critically about the science of animal behavior, unlike most other classes I've taken at UBC.” Another said, “Prof. Timbers is simply fantastic. Her interest in the field really shined through in her lectures, and really stimulated our interest on the subject. She made every effort to answer all of our questions, and when questioned on things beyond her knowledge, she would go out of her way to search for answers so we can discuss them in the preceding lecture. Exams also require critical thinking instead of pure memorization, which made writing it both challenging and rewarding!”

Lastly, I recognize that many students struggle to develop effective learning practices and skills. Not all students are aware of different pedagogical learning styles, let alone which style best suits them, or what “out of classroom” study habits are most efficient or effective. I believe that it is our job as educators to help students learn how to self-learn. Ways that I have implemented this are: *(i)* providing awareness to each student of their learning style through quick and simple self-assessment questions and/or quizzes, *(ii)* informing students which study methods are most effective (*i.e.* testing oneself repeatedly instead of simply re-reading one's notes and the text book), and *(iii)* as mentioned above, integrating group work in teaching to help students build a supportive peer learning network. I believe incorporating these strategies lays a foundation of self-learning skills that students can build upon throughout their lifetime.

Emerging technologies and innovative practices in teaching and learning

To continually develop my teaching skills and best support my students' learning, I strive to incorporate new technologies and practices in teaching and learning. Examples of emerging technologies that I have utilized are the free online quizzing system Socrative; Github for student submission of homework, quizzes, communications and student peer-review; and the Slack messaging app for student-student and student-instructor discussions. When I teach R, I usually use the RStudio integrated development environment and when I teach Python I use the Jupyter notebook.

Interactive teaching practices that I use in the classroom include live-coding where students follow along on their own laptops. These sessions are interspersed with challenge problems. To ensure students are following along I implement a "sticky" system, where students have two colours of post-it notes, with one colour (*e.g.,* yellow) meaning "I am following" and another colour (*e.g.,* blue) indicating "this is confusing". This allows me to quickly and easily check-in with students and adjust my teaching if necessary. I have also implemented this sticky system electronically via the John Kimble open-source, live feedback system for classrooms.

I also encourage students to work together to foster peer-learning as much as possible. Ways that I facilitate this are through group activities in the classroom, group homework/lab assignments, and peer code review. It is amazing how much students learn about reusability, readability and documentation when they have to read and run another person's code.