Teaching Philosophy

My experiences at a variety of institutions informs a great deal of my teaching philosophy. I have extensive experience teaching undergraduate students at a variety of institution types, developing new curricula, activities and rewritten laboratory exercises. Currently, I typically teach introductory astronomy lecture and lab at St. Thomas, as well as algebra-based introductory physics for our pre-med and other health professional students. I have also taught calculus-based introductory physics for our majors and engineers. These courses involve engaging students from a wide variety of scientific backgrounds and mathematical skill levels. At other institutions I have taught mostly introductory astronomy, though I have also taught an Energy Issues and Solutions course for non-majors as well. It is my goal to excite students about science in general, and to bring interest and understanding of what scientists do to those who may not initially have considered science as a career path. Part of this goal is to draw more students to the program, but more importantly, critical thinking and creative skills and especially the excitement will hopefully carry over into students' lives even if they do not choose science as a path for their own careers.

I try to facilitate our students' development of skills such as the ability to think critically ("Does this answer make sense? Why?"), the ability to work well in groups, and the ability to think creatively about connections within situations and solutions to problems they encounter. These skills enable our students to be successful in their daily lives, job environment, or highly competitive scientific collaborations. Of these, I strongly feel that the creative process is an area vital to the scientific process, a fact that many students are not aware of until their first time as a graduate student trying to write a proposal for funding or observing time. Fostering this aspect of the scientific process is especially critical in several ways: first, it gives our students of a vital skill they need to excel as scientists; second, it casts science as a process rather than just "facts," especially at lower levels; third, it infuses science with the fascinating joy of creativity that is the powerhouse behind discoveries. It is therefore my main challenge to address some of the most interesting topics at an introductory level in ways that foster creativity as well as the critical thinking skills we expect introductory students to take away from the course.

Because of the variety of courses I have taught, I have had to use a variety of techniques depending on the class size. For example, I sometimes break the large lecture style class into groups for group work, lecture tutorials or discussions, in combination with a short lecture to introduce the topics. In some classes, I have had students choose from a variety of projects (e.g. posters, dioramas, essays or presentations) to encompass different learning styles. I have become creative in the use of essays, allowing more formats than just the traditional college essay; my favorite from this past summer was a nearly spoken-word format that was similar to oral traditions. I also have used a "create your own museum exhibit" in the introductory class, which the students find fun and challenging. I am fortunate that at St. Thomas we have small class sizes similar to Carleton for our physics courses, in which I can use teaching methodologies that are more intensive workload per student. These classes are combined lecture and lab, which gives free reign to a variety of teaching tools. I tend to lecture very little in these classes, weaving small pieces of lecture to bringing together ideas while students work together on a variety of exercises, labs, and group problems. I also have worked modified active learning processes into my larger lectures for the astronomy course, which could be adapted to a larger course for introductory physics. I continue to actively pursue new teaching methodologies to enhance my classes. I am excited for the opportunity to teach upper level courses, such as the major-level astronomy course, electricity and magnetism and others and believe that my experiences in teaching methods will carry over in developing course materials at higher levels.

In order to ensure that my teaching is effective, I use both quantitative and qualitative techniques to assess and evaluate student understanding and preconceptions. In my courses, both formal and informal assessments help students inform their own understanding through multiple choice and open-ended essay questions for exams, essays and group projects, and discussion-based lectures and activities. During student discussions, I am able to develop my own qualitative insight into their understanding of the material, enabling me to guide their learning toward areas where they need further development. I am always looking for new ways to increase student engagement and ownership over physics and astronomy in their introductory physics course. I also am currently redeveloping my course to align better with the needs of the biology and medical science community.

For those who want to study science, and in particular physics and astronomy, my hope is to mentor them and encourage them to reach their fullest potential. I recognize that not all students begin at the same point, and many students also need different support levels than they think they do. Sometimes, students come to college – especially an elite school – with the expectation that scientists are "smart" and that you have to be naturally "good" at science to pursue it as a career. This can be challenging for students when they find the first thing they have to work hard to understand; teaching critical skills in coping with coming that point, and helping them to understand that everyone will find a time where they will struggle is part of my role as a mentor. In addition, breaking down that assumption opens up the realm of science to students who may not have initially considered it.

We also know that under-represented groups have interest in doing science coming in as freshman but more drift away throughout the time they are in college than their white male counterparts. There is some research into why this is, though we also have to recognize that education research as a whole makes significant assumptions about what works and for whom. For example, it is important to keep in mind power dynamics along intersectional lines with our under-represented groups in our classrooms, but. Carefully monitoring group dynamics and allowing ways for all students to find ways to interact in comfortable ways is vitally important in the classroom dynamic. As I mention in my cover letter, I have been involved in our Anti-Racism Coalition at St. Thomas and several other equity groups. Race is not the only axis to consider; others clearly include LGBTIQA+ and women, which all intersect in complex ways. Though I am still working on this in the classroom, it is my goal to make all students feel that they can engage in the classroom. I have found that addressing race in specific has opened students up to feeling more comfortable in discussing many aspects of their lives that affect them. I recall Carleton being very inclusive – in fact so much so that entering graduate school was a shock – and I would like to continue this atmosphere by further involving myself in efforts both in making education research more inclusive and direction through campus initiatives. In this way, I hope to support *all* students in their education.

As a mentor, I find it personally enriching to watch students grow into students with rich experiences, both as scientists and as people. In addition, I believe that it is our duty to prepare students for the world that they hope to join as scientists – or for our more general audience courses, as people who can critically think about the world around them. I have experiences in a variety of different settings which I believe can offer valuable insights to students. I believe that mentoring also includes helping students through difficult spots and preparing them for challenges they will meet later. I hope to help students develop the means to handle situations when they encounter them. For me personally, this means that I must continue to try to find new ways to teach and bring students into the exciting world of science. I intend to continue seeking out new pedagogical methods in addition to the ones already in my repertoire.