

Teaching Statement

As an aspiring faculty member, I believe teaching is an essential part of my training. I found myself drawn to pursue graduate studies and continue on the academic career path largely due to the wonderful teachers, professors and mentors whose classes, research supervision and professional guidance I've had the privilege to benefit from. I would therefore like to give back to the academic community by teaching and mentoring future generations of scientists.

Teaching Experience

As a first year graduate student, I was a Teaching Fellow (TF) for the Harvard College course "Life as a Planetary Phenomenon", led by Professor Dimitar Sasselov. This is an introductory science class for non-science majors that addresses the fundamentals of life and evolution in the context of astronomy, physics, chemistry, biology and geology. My duties as a TF were to lead weekly two-hour sections, hold office hours, grade homework and exams, and participate in staff meetings with the other Teaching Fellows. As a TF for this course, I learned how to explain concepts that are obvious to me as a scientist, such as Kepler's laws or the periodic table of elements, in an understandable and accessible way for non-scientists. I also had to go outside my academic comfort zone by learning and teaching concepts I was unfamiliar with, such as explain to the students how to look at various microorganisms through a microscope, or the history and composition of rocks, minerals and fossils.

In addition to this, I was also a Mentor Scientist at the Science Club For Girls (SCFG), a forum in which undergraduate and graduate women students in science, technology, engineering and mathematics (STEM) teach elementary school girls some basic scientific concepts in a fun, interactive way. Together with two other co-mentors, I taught for two semesters: the class "Sound and Light" addressed to second grade students, and the class "Oceans" addressed to fourth grade students. The format of the classes was usually a combination of discussion and hands-on experiments – for example, second grade girls had to make a prism and shine a flashlight through it to see the forming rainbow, and fourth grade girls had to filter dirty water using sand and cotton filters. As a SCFG Mentor Scientist, I learned how to explain very basic scientific concepts in a manner that is intuitive and understandable for young girls, as well as resist the urge to jump in to help the girls in their experiments, but rather let them figure things out by themselves.

Teaching Philosophy and Methods

My teaching philosophy is primarily based on the classes that I found enjoyable and learned the most from, as well as on my own teaching experience.

I firmly believe in making even the most advanced courses as approachable and accessible as possible. For this reason, I think the most effective strategy is to start with simple concepts and equations that are easily understood by an undergraduate or graduate audience (e.g., Newton's second law), then gradually build to more and more complex ideas (e.g., Einstein's theory of relativity). On the same note, I think that any equation that is written on the board or in a Power Point/Keynote presentation should be first explained in detail conceptually, so that it seems obvious and natural where it is coming from once presented.

The most successful classes that I have taken were primarily chalkboard based with minimal slide show presentations. I would therefore apply the same method to the courses that I would teach – I would focus on writing most concepts and equations on the board, and only use slides to show relevant images or movies. I believe this to be the most effective way for students to gain as much as possible from a class, since having to jot down what is written on the board keeps one both interested and focused on the subject matter, while a student can be much more easily distracted if a whole lecture is a slide show.

As a theorist who often uses pen and paper in her research endeavors, I would certainly incorporate order of magnitude (OOM) calculations in every class. For astronomy courses, I would ask questions such as “What is the most efficient way to pack mass in a planetary system, few large planets or many small ones?”, “If everyone on our planet were vegetarian, how much would greenhouse gas emission would be reduced?”, or “How long does it take to cook an egg? What about a turkey?” (questions inspired by Prof. Ruth Murray-Clay). I believe that OOM problems can develop students’ intuition about physical processes, as well as make them realize that simple OOM calculations can give accurate answers for complex astronomical questions. For students who are interested in theoretical astrophysics research, OOM calculations are essential for understanding what physical effects matter in a given project, or what problems are worth pursuing.

Finally, a portion of the courses that I would teach would be focused on discussing papers in the field that are relevant to the subject matter of the class. I think this would stimulate students’ interest in literature research, as well as give them the opportunity to give an oral presentation in front of a friendly audience. These skills are essential both for students pursuing an academic career and for those who choose a different professional path.

Teaching Prospects

My research interests and expertise lie in the areas of protoplanetary disks and exoplanets. As a PCEP scholar at the University of Chicago, I would like to teach classes primarily related to my field. This would be beneficial both for students who enroll in my proposed classes and for my own development as a teacher, since I have not yet had the chance to lecture advanced astronomy courses.

One course that I would love to teach is ASTR 45800, Exoplanets. Based on my previous and proposed research, which focus on protoplanetary disks, planet formation and the disk-planet interaction, I have the necessary expertise to teach this class, and I would like the opportunity to share my knowledge with future astronomers in an accessible way.

While my research is primarily focused on planets and disks, I would like to branch out and teach ASTR 30100, Stars. Many of the methods and approaches that I used in my core accretion project apply to stars as well, such as the equations of stellar structure, hydrostatic balance, energy transport, equation of state, or stellar models. Additionally, this would be a great opportunity to review concepts that I learned from my own class on Stars, as well as learn some new things when I prepare my lectures, similarly to the undergraduate class that I taught.

Finally, I would like to propose a new Order Of Magnitude course, targeted at both undergraduates and graduate students in astronomy or related fields. In this class, I would use some of the questions and techniques mentioned in my teaching philosophy, as well as additional ones, with the ultimate purpose for students to better understand the world around us, learn how to tackle research problems, and be able to give impromptu oral presentations.