Mao Tian Tan

Teaching Philosophy

One of the most enriching experiences I had while I was a graduate student at the University of Chicago was the opportunity to teach. I was a teaching assistant for several quarters for various undergraduate courses including classical mechanics, quantum mechanics, and statistical mechanics. My teaching responsibilities included leading discussion sessions and conducting lab sessions. Teaching undergraduates over the course of a few years has shaped my teaching philosophy and approach.

I believe that the most important thing a teacher must be able to accomplish is to help the students understand the course material better than if they had simply read the textbook on their own; otherwise there would be no point in them coming to class anyway. A common pitfall that many undergraduates succumb to is getting lost in the sea of algebra that comes with learning physics. While it is certainly crucial for students to know how key results are derived and how to solve technical physics problems, in my opinion, the role of a physics teacher is to highlight the main concepts and how they are related to one another. When I was a teaching assistant for upper-level statistical mechanics class, many of my students got confused by the myriad of ensembles they encountered in the course, namely the microcanonical ensemble, the macrocanonical ensemble and the grand canonical ensemble. To help them understand the differences between these ensembles, I gave them a bird's eye view by dividing the board into three columns and summarizing the main properties of the ensembles, comparing, and contrasting them. Then I explained that, in the thermodynamic limit, these ensembles coincide. At that moment, these concepts began to click for my students and they told me that it was very helpful for them. If I were to teach undergraduate courses as a professor, I would take this approach. While I would certainly explain how some of the technical calculations are done in class, I would like to emphasize the logical relationship between the ideas. For example, assuming certain postulates and laws, what physics could we observe?

A challenge many lecturers face is maintaining the attention of their students. It is very easy for students to zone out in an hour-long lecture. When I conducted discussion sessions as a teaching assistant, I found that the best way to keep students engaged in the discussion is to get them involved in the discussion. I like to pause the discussion at appropriate times and pose questions to the students to let them think about the material. If I were to give a lecture, I would probably want to have mini-quizzes in the middle of the lectures to keep the students engaged.

The education of undergraduates should not be confined to the classroom. It would be an enriching experience for undergraduates to get involved in actual research, especially for those who plan to attend graduate school in physics. If I were to become a faculty member, I would be able to come up with projects that are suitable for undergraduates to work on. It is important to strike a balance between the difficulty and the importance of a problem. On one hand, the problem should be original enough for the result to be publishable in a peer-reviewed journal instead of assigning trivial and meaningless calculations to them. On the other hand, the problem cannot be too open-ended and difficult otherwise the undergraduate will not be able to make any progress. The ideal project for undergraduates should involve applying known techniques to unsolved problems. There are several problems in my field of research that match these criteria, so it would not be too difficult to involve undergraduates in my research program.

Even though I only had the chance to teach for a few years as a teaching assistant during my PhD

program, I found the experience to be exciting and rewarding, and if I were to become a faculty member, I would be delighted to continue teaching. I am committed to continuing to grow as an educator. I view teaching as a practice that evolves, informed by feedback from students, discussions with colleagues, and ongoing reflection. My goal is to cultivate classrooms where students not only learn physics but also gain confidence, critical thinking skills, and a sense of belonging in the scientific community.