Statement of Teaching Philosophy and Experience

Throughout my academic career, I have been heavily involved in teaching and mentoring students from a wide range of cultures and backgrounds. This has included working as a teaching assistant during my graduate studies at University of Hawaii at Manoa where I organized and led 2 undergraduate Physics Laboratory classes of over 20 students each for a total of 3 semesters. In addition, I have also led weekly, 2 hour long, one-on-one tutoring sessions for 3 semesters. Student evaluations for the effectiveness of my teaching and ability to communicate information were "excellent".

My philosophy for teaching can be summarized in two points: self motivated drive through curiosity, and mastering through iteration. Fist, when teaching at any level, and especially at the undergraduate level, it is very important to never get bogged down by the equation or numbers. When I begin a class or introduce a new concept to students, I always first demonstrate the experiment itself or introduce the context in an illustrative way. This is to engage the students interest and entice their curiosity to develop a long lasting self motivated drive to learn. Curiosity is where science is born from and curiosity is what drives science forward. This is true whether one is an freshman student or a Nobel laureate. Second, iteration is the key to mastering a topic. No matter how gifted one may be, no one is able to perfectly master a topic instantaneously in a single trial. On the other hand, this also means that even if one is not naturally gifted at something, it can be mastered through repetitive iteration and failure. The process of iterative learning is how the human brain naturally works and is the key to effective learning.

As an example of the above, there was a Physics Laboratory class in which I needed to introduce damping of a driven harmonic oscillator in a medium with finite viscosity. I knew that the equations describing the physics behind this process could be tedious and difficult to grasp at the freshman level I was teaching at. But I also knew that the concepts themselves were not inherently hard because we all intuitively know from our experiences swimming in a pool, how viscous media affects forces. Before going through the equations, I turned on the experimental apparatus first, and asked the students what they thought would happen when the frequency of the driving force was modified in different ways, while at the same time, observing their satisfaction and surprise when their predictions were confirmed or debunked. This effectively created a vastly more engaged and thoughtful atmosphere for the class and let the students concentrate on the "physics" of the class while helping them to more intuitively understand the equations involved. Of course, it is equally important for the instructor to not "give away" all the answers by doing all the work. The students were left to make multiple failed attempts until they were able to get just the right settings to take successful measurements.

In society today, there is an unfortunate misconception that Physics is a difficult subject only for *smart* students. Nothing could be further from the truth. When students feel that they are not smart enough, it is important to let them know that Physics is not about intelligence, but about curiosity driven iterative learning. All professional Physicists stand on the shoulders of past giants, and almost no research today is conducted solely alone, but through collaboration and teamwork. No one is *smart* enough to do all the work alone. I usually use myself as an example. I come from a small regional college in South Korea with very little opportunity, but through diligence and iterative trial, I have had the opportunity to eventually work with some of the brightest minds in some of the most innovative projects in the field of neutrino physics.

Mentoring higher level graduate students may be slightly different but I believe the same overall approach remains the same. I have taught Geant4 Monte Carlo particle simulations to 3 undergraduate and 3 Ph.D. students at the University of California, Los Angeles (UCLA). My method for teaching this toolkit is to learn together with the students by going into the details of the code and doing this repetitively every week. Not all the concepts may be clear to students in just the first trial, but through iteratively going through and encountering similar problems multiple times, students will eventually understand and learn basic coding techniques as well as tricky concepts that may not have been evident at first. Here, it is important to be immersed in the task along with the students instead of teaching from a conventional top-down approach because learning how to code is not just about acquiring the skill to code, but about learning the culture of coding. By this I mean that there are certain useful tools and methods of accomplishing a task that can only be learned through going into gritty details and getting *dirty*. As students grow and become more knowledgeable, they can start to develop and choose their own methods and tools. Through this approach, my students have successfully been able to take on simulation tasks of their own and contribute effectively to the collaboration.