

Well, one of the main challenges that students coming into this class are facing is that for many of them, the last time they did an experiment in a physics class may have been a high school class where the experiments were set up to in a certain sense, just work. So they could push the button and get the data and then learn something about whatever the piece of physics that was being studied, whether it was colliding two carts to learn about conservation of momentum, or swinging a pendulum to learn about harmonic oscillators, something like that. Usually, the instructor who taught them that experiment set it up in such a way that the experiments were themselves were not the challenge. It was learning the physics.

By the time students get to their third year of the physics major, they really know an extraordinary amount of physics. And that is really a secondary goal of what we're teaching here. Junior Lab is really about the professional development of the student as a scientist, and that means things like approaching a difficult piece of apparatus with an attitude that you're going to be able to get it done, understanding that anything you try is not going to work the first time. You're going to have to debug it. It's about keeping very careful records of what you've done, so that when you have to go back and repeat it, you can see what you've done.

There's a large number of things that sort of add up to, this is the way a professional does it, which is different than almost anything they've done previously in their career as a physics student. So one of the great challenges is if they think they know how to do experiments, they may have learned it in a way that was a little bit more of a novice approach before. So there may be some things they have to unlearn before even getting started. And we spend about the first month of the class working on things like that.