

JANET CONRAD: So I think that one of the hardest things about Junior Lab is that you're asking students to do something that they really have not done before. They have not, for the most part, there are a few that will have actually worked as what we call UROPs, undergraduate researchers. But for the most part, most of them have not been on their own independently working in a lab, where they have to figure out what are their goals?

They have to figure out what is the outcome that is going to be good enough, and so forth. So there's a couple of things that they learn over the arc of the semester. So one of them is how to actually budget your time so that you can actually get a paper out. Papers don't actually end. They just stop.

You know, there reaches a point where you're just like, OK, I'm done. And I'm going to stop. And learning how to do that is something that just takes a lot of practice. So there is that. Then they're actually also learning a set of practical skills that I definitely see evolution on over the semester. So especially with error analysis, they really improve after lab one.

So they will have done the lab 0, which is the set of three. And those, they are walked through rather closely. Then, they're on their own on lab one, and the errors analysis is always really interesting. And then we work on that a little bit, and you find that they get much more sophisticated about error analysis. And the very best ones start learning all kinds of things about error analysis that are not just the standard things.

I had a student this semester who was very excited about learning what called the delta chi squared method, which is where you have a model, and you change your model so it introduces some extra parameters. And you look at how much of a change of chi squared you get, given the change of degrees of freedom that you just introduced, to see if that model is a better model than the one you had before.

And so they become much more sophisticated, and that kind of thing. They also become much more relaxed with the equipment. They understand how the equipment works. Usually by a lab two, somebody has broken something and discovered that it didn't really mean the world ended. It was OK. So they are more willing to actually be more adventurous, and just come in and set things up, and so forth.

And also, they will have gotten into the groove with their lab partner. And that's an important

point also. Most of the time, they don't seem to know their lab partner before they get started. And so figuring out what each other's better skills are, and how you play them to advantage, is an important thing for them to do.

And it's important in real life, too. Most physicists work in small collaborations, or even big collaborations. So being able to work with somebody and figure out how to bring the best out of them is a very important thing.