Agilent Case Study: Boston University

All Together Now

Agilent helps professor break new ground in teaching instrumental analysis

The old way of teaching instrumental analysis wasn't going to work for Rosina Georgiadis

A professor of chemistry at Boston University, Georgiadis didn't want her students to struggle the way she and every one of her peers had struggled to master the ins and outs of complex analytical instruments.

She didn't want them to continually wait for help from a lone lab assistant, afraid they'd mess up and damage a costly instrument.

She didn't want them to simply run a sample through an instrument that had already been optimized for their experiment, so please don't change anything!

She didn't want them to jockey for time in the lab, often having to go there late at night when the instrument they needed was finally free.

She *did* want them to all be working on the same experiment at the same time, which was not how it worked when she was a student. By necessity, her labs had taken a round-robin approach back then, with different groups working on different instruments, then rotating, to make the most of limited resources.

"All of my students do all of the experiments, and we do them all in the same order," she says.

How is that possible with twenty-some students in her classroom and only one GC/MS or one LC/MS in the lab? Two words: virtual machines.

Georgiadis admits to being naïve about what it would take to make her vision of the course a reality, but Norman Lee, who directs the university's Chemical Instrumentation Center, put her in touch with Agilent, including Steve Gagliardi, who at that time was Global Director of Academic and Research Sales. "He completely got it, and he knew that no one else in the world was doing this," Georgiadis recalls. "He said that to me. I remember we were in this conference room next to our Chemical Instrumentation Center, and Steve said, 'Well, there's something in Singapore, but it's not like this.' He was the one who made the BU VM (virtual machine) project happen."

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Georgiadis was impressed by how receptive and quick the Agilent team was—"I talked to them in July and rolled this out in September"— putting five different kinds of instruments on virtual machines, or VMs, over the course of the semester, allowing each of her students to run an instance of the VM on his or her own laptop.

"My vision was: Every student would drive their own car, so to speak, and they could take it in the direction they wanted to go," Georgiadis says. "I would lead them in terms of how to turn it on, what sort of things to check for, what could go wrong, and how to navigate so it wasn't scary. And they would get enough out of the experience so that they would get some expert-like skills."

Now, her students can't imagine doing the course any other way, saying, "You mean other people don't do this?"

"They love using the VMs. They can move things around easily and share it in a way that's really great. They can help each other. The experience is not that they are alone in this. We might have a discussion and they can hear what other people are talking about and they can go over and see what they're talking about. Or we can project it to the front of the room. But it's low stakes. You can make mistakes. You can't break this," she says.

One of the great things for students is that Agilent instrument software contains data sets and example methods that they can play with and learn from.

"The teaching fellows and I can also collect data and give it to the students. When they're in the lab, they are using their own data. They can take a spectrum in the lab, then go off to their laptop, check things out, and see if they can complete the experiment we're asking them to do. Everyone is talking about the same experiment and trying to achieve the same thing, so you can have more of a conversation. Some student teams may have decided they would collect the data differently: 'Oh, we wanted to save time and do it this way.' Then you can compare with other teams. It's really interesting to see what they come up with," Georgiadis says.

"You shouldn't have to spend all your laboratory time trying to figure out how to get the instrument to do what you want it to do. My students ask different questions when they're in the lab. They don't say, 'I've been trying to do this for the past hour. How do you do it?' They don't ask that. They ask deeper questions. I'm trying to do something a little more in depth than getting a single print out, something more nuanced, more expert-like. An experiment. How good is it? Can we make it better? Scientists don't just get the answer and leave. They compare things. They do it again. They try different controls. They share their data with other people. The way we train scientists in laboratories is artificial, and I'm trying to improve that."

To that end, Georgiadis is developing educational materials to help other instructors use VMs for active learning in various laboratory courses. She is also actively seeking collaborations with other institutions. Meanwhile, Norman Lee is extending the use of VMs for training graduate students, post-docs, and teaching fellows at BU, and Agilent's Jim Lynch is spearheading Phase II to extend VMs to other universities.

Learn more
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