

## Active Learning in General Chemistry: Niva Tro & Students

**Nivaldo J. Tro, Ph.D., Santa Barbara City College:** Research into Active Learning has been going on for some time. So much evidence has mounted that has shown that Active Learning is the superior way for students to learn. In fact, a study was published in the *Proceedings of the National Academy of Sciences*, which was a mega-analysis of hundreds of other studies, and the conclusions were clear: Active Learning means that students get higher exam scores and they have lower fail rates in their courses.

**Student #1:** The most helpful thing for me to be involved in the lecture and to be more hands-on is for me to study the material before the class. So he's giving us these pre-lecture topics and we're solving them, and we're working through it, and then we get introduced to it into the lecture. That's probably one of the best things that I've found to be most helpful in my education in college.

**Student #2:** So instead of having straight lecturing during the class period, he makes sure that we have practice, do a lot of practice problems, and also collaborate with our peers so that we better understand the information.

**Student #3:** So previous to my other chemistry classes, I didn't really understand chemistry. I would get, like, low Cs and nothing higher than a C. But in this class, I'm getting a way better grade, I'm getting an A because of Nivaldo Tro. His textbook, his lessons, everything about his class is really- it's really powerful.

**Student #4:** I really enjoy the pre-lecture assignments because we get to learn them on our own and then when we come to lecture it kind of solidifies our understanding. And then, if we have questions that we need to ask Tro, he's really good at answering them.

**Student #5:** Having before class assignments are super helpful, because you go into class already understanding some of the material. And it's not like you have to learn it on your own, but the videos that he puts up to help with the pre-lecture assignments are really helpful.

**Student #6:** Really, really engaging the students by creating Learning Catalytics. We go over material, we go over an example of the material, then he gives us a problem to do in class for points, which is only a small percentage of your grade, but it still keeps everyone paying attention, off their phones, because if you lose the points, you lose that miniscule percent on your grade.

**Tro:** Now students have short assignments that they do before class and after class. These assignments ask questions, the students gotta answer those questions, and the idea is to break up their learning into smaller chunks. My main goal in this revision was to develop tools that you can use in your class to implement research-proven teaching techniques with a minimum of effort.