

In the Spring of 2020, I taught my first Numerical Methods class for sophomores in Mechanical Engineering. I had been teaching Computer-Aided Design (CAD) classes for 4 years, so I was comfortable in front of a classroom and knew most of the students. I had used Matlab in academic research for 6 years (I am currently pursuing my D.Sc while teaching full-time) so I was comfortable there as well. Some of the math was new to me – I had not really dug deep into regression, interpolation, or root finding before, but my linear algebra was solid. Most of all, I was excited. I had the opportunity to teach a more ‘academic’ class than I had taught before and honestly, I really enjoyed the material. Call me a nerd, but I love the intersection of the elegance of calculus and linear algebra with the crudeness of using numerical algorithms to plow through differential equations or finds roots or optima. It’s like winding up a little machine and watching it naively solve problems for you.

I suppose I assumed that that enthusiasm would carry me through teaching a new class while also teaching two sections of CAD, a lab class I was still writing activities for, and working on my doctoral research. Enthusiasm for the material had gotten me good teaching reviews in the past even if I had not had a lot of time to prepare slick presentations. For a while it was fine. In the time I had, I pored over the textbook and wrote example problems until I felt solid on the material. Then I got up in front of the lecture hall and delivered a hot-off-the-presses lecture at top volume – there was a lapel mic, but I didn’t need it. As far as I can remember, the lectures went great. I spent a couple of lectures on Matlab language and then jumped into talking about algorithms.

A few weeks in, the grumbling started: “The homeworks are way too long,” “We don’t understand what we are supposed to be doing,” “You need to give us some assignments that show us how to do this stuff.”

They were right. I had assumed everyone else would pick up Matlab the way I had, which was to get thrown into solving problems using Matlab and learning from the Help file. It worked great for me, but it’s not a way to teach a class. Don’t get me wrong, I had some die-hards who were hanging in or excelling, but I was leaving behind half the class.

After that I shortened the assignments a bit and started adding problems that walked through the steps a little more explicitly. These students had had calculus and differential equations, but they were brand new to algorithms and needed to be walked through a bit more slowly. It seemed to work. Either that or that material was just starting to click after powering through all of those “too long” assignments.

Then the pandemic hit and suddenly we were on Zoom. I don’t care how enthusiastic you are, you’re not going to keep 60 college sophomores engaged in learning about polynomial regression and splines for 80 minutes over zoom. I knew that, so I came up with several ten-minute activities each class that students could do in breakout rooms to break up the lecture. It helped, but maybe not enough. In the end, we all made it to the end of the semester, we all got our work done, and I think we all learned (I sure did).

In the teaching evaluations I saw two clusters: There was a large group who gave me great marks and said it was a great class. To them I say, “Thank You! I really tried to make it good!” There was a similar size cluster of students who gave me mediocre reviews. The complaints were in the delivery. Basically, they found the class boring. To them I say, “Yeah, I get it.” As teachers, we all did our best to adapt to the overnight change in teaching modality. In some cases this fell flat. The comment that really stuck with me: “There must be a better way to deliver this material.”

My takeaway from all of this is that online learning needs to be engaging and we all need to be thinking about how to make that happen. Students have probably been nodding off and zoning out in lecture halls for centuries (I realize this is not the desired effect, but don't tell me it doesn't happen). But to take them out of the classroom and have them try to do better in isolation in front of a screen is unrealistic. Like many teachers, I have devoted a good portion of my summer to learning how to engage students online. Break material into bite-size pieces. Give it interactive activities like quizzes and polls. Yes, sometimes the assignments need to hold your hand for a while until you get on your feet. I won't list pedagogical tools, but you get the idea.

My parting thought is a trite one: every adversity is an opportunity to improve. I had been meaning to flip my CAD classes for over a year, but never really came up with the time to create all the new online material. Well, it's happening now and I think I'm in better shape than ever to know how structure that material. I really do believe that we have the impetus and opportunity to improve the way we teach and leverage technology. I hope to someday see a crowded lecture hall again, but I also welcome the challenge of making remote learning fun.