

Teaching Statement

When I teach, my role is to cultivate the students' interest in and add context to understand the material. In my experience, rooting the teaching of the technical material in a real world context helps the students understand the technical material more, and finding interesting examples keeps class engagement up. While simple in concept, the execution can be critical. My aim in teaching is to improve all aspects of the course, including lectures, assignments, and projects, for this purpose.

Early on in my teaching, I often just repeated explanations of the material to the students, but my teaching ability had to adapt as my responsibilities grew. Explanations of concepts on their own often don't help students understand the ideas deeply to remember them, as they remain too theoretical. Therefore, I now design courses in such a way that students are regularly engaged with real-world examples and active engagement in the material.

I experienced this most saliently in my project-loaded Digital Signal Processing course at Swarthmore College. Initially, I sought to make the projects simpler and easier to understand, so the students wouldn't have to deal with as much real-world complexity. Experimentally, I increased the complexity and difficulty of the projects throughout the semester in order to make them more relevant to real world applications (e.g. sound compression). Despite the increase in difficulty, the projects received universal praise from the students, and they felt they understood the concepts better.

Interest, while vital, cannot automatically make a student understand the material – the students need to connect the material to their own background. This is what a teacher provides that a textbook cannot. Students come in with diverse backgrounds, and each student needs a different context to connect to the material. For example, during my PhD, I was the head teaching assistant in the virtual linear algebra course Master's of Computer and Information Technology (MCIT) at the University of Pennsylvania, for students without a background in computer science. I had to drastically change the context I was giving for each student during office hours: keeping things short for one student having to take care of her toddler while calling, repeating things a few times for another student sleepily calling from another timezone, giving higher level explanations for another who already had a strong math background. Since these office hours were virtual and one-on-one, I was able to cater my explanations this way.

Adapting material to students' backgrounds becomes much harder when designing a course for more than one student. While teaching the first year Embedded Systems course at Swarthmore, I was given the impossible task of satisfying both students who had been programming for years and ones who had never seen an "if statement" before. I had to adapt and slow the pace of the class while giving in class assignments with Arduino hardware to keep everyone in the class interested. In a different vein, switching from teaching Master's level courses at Penn to undergraduate at Swarthmore forced me to adjust my teaching quickly. I had to catch myself many times assuming technical knowledge the students didn't have, such as properties of complex numbers. I carefully listened to questions in class and quick feedback from low-stakes quizzes to help adjust the pace of the courses. Another example would be cross-disciplinary classes and research. I co-taught "Visual Culture through the Computer's Eye" with a PhD in Art History, where we had to design a course for both computer science and visual studies students. We had to cover the basics of both Computer Science and Art History in a way that would allow them to design their own interesting projects. In every course, adaptations need to be made for the ever-changing student backgrounds.

From my experience, lectures often cannot be adapted to fit all students' backgrounds, especially in larger classroom sizes, as there is one lecturer and many students. Since Swarthmore is a small liberal arts college, the class sizes were often small, and I could adapt material to the handful of students I was teaching. However, in the larger courses I have taught such as the Embedded Systems course at Swarthmore (60 students) or the Advanced Robotics course at Penn (40 students) this is infeasible; for classes of sizes even larger it is hopeless. When

lecturing in these cases, one must be creative in their approach to keep students of many backgrounds engaged. For example, in the Embedded Systems course I designed the lectures to have in class student polls to help students engage with the material. Furthermore, we added in-class programming assignments at the end of each lecture to help have practical knowledge. Adaptations like these can make lectures more effective, but they can only do so much.

I have found that office hours (or, increasingly, online class discussions) are more effective at adapting material to individual student backgrounds. I have found it most effective to find out what a student's background is and to try to present the material in a context they have seen before. This is particularly relevant in the MCIT linear algebra course where I was head TA. For instance, in office hours, a student asked why we were learning all the definitions in the class in such an abstract way. I gave him the example of the Fourier transform – a widely applicable tool but, being an infinite dimensional linear transformation, the abstractions learned in the class were needed. What the student wanted was to know that these topics were not only of interest to academics, but in practical applications as well. For those who can make it to office hours, their more personal allows for more accommodations of student's needs.

Some problems have less to do with the material itself, and more to do with the cultural background of the student. For instance, international students have to deal with a new culture while trying to learn complex concepts often in a language not their own. My own experience has made me sensitive to students acclimatizing to a new culture. I spent most of my childhood overseas, and thus spent many of my formative years falling in the boundary between cultures. Coming back to the United States was a culture shock, and so I relate to the many students who have similar experiences. International students are not a rare occurrence now, as I saw at both Penn and Swarthmore. I strive to keep learning about the cultures of my students, both through personal connections and more formal training.

In conclusion, my goal as a teacher is for the student to make the material their own, so that they have the context to understand and the interest to pursue it. My hope is by the time the class is finished, the students would have grown past their need for me and are prepared to face the world on their own terms.