TEACHING STATEMENT
– Sergio Verduzco-Flores –

My teaching philosophy is based on one fundamental belief, that significant learning only happens when the student takes responsibility for her own education. Teachers, and other learning resources are meant to help remove the obstacles in the student's journey, but it is up to the student to find the right path.

My beliefs about learning come from my own experiences as a student, from my experiences as an instructor, and from my inquiries on how cognitive abilities may be acquired. As a student I have traveled the path from living in a small Mexican city, where intellectual pursuits are not a priority in most people's lives, to being a postdoctoral researcher developing computational models of brain regions. I have been a calculus instructor at the University of Pittsburgh, as well as a teaching assistant for the courses of Matrix and Differential Equations, and Algebra. And as someone who is always wondering how the brain works, learning is something I often think about.

The basic insight I want to convey here is that to effectively acquire knowledge, people have to form mental models in which the different chunks of information they receive form a congruous whole. For example, history students are trained to ask specific questions (why did the Aztec emperor not attack the small Spanish army?) until they have fleshed out a story where the behaviors of the individual actors conform to the student's conception of plausible human behavior. Moreover, the character of each actor and the relevant factors of their circumstances can be inferred. This compact, coherent representation of what happened can be used to aid reasoning and form conjectures about other events.

The main point about this example is that only a student knows where the gaps in his mental models lie. Filling those gaps proceeds similarly to the scientific method, creating and testing hypotheses. This requires an active engagement from the student, who has a partially constructed model and is asking questions to sort out the confusing parts. For example, the concept of limit is central in the ambit of infinitesimal calculus. Not even the brightest student will initially understand this concept from the raw mathematical definition. This concept is slowly built. The student can first deal with the type of problems that motivated it, such as Zeno's Achilles and the Tortoise paradox. The student can then work out the limits of algebraic expressions as a variable approaches a value, which shows that limits fit well with things that the student already knows. Finally, the student can apply the concept of limit in derivatives, integrals, and their many applications. Through this process, the students who are constantly generating questions to eliminate gaps in their models (does the symbolic derivative actually yield the same values as the limit? Why can the antiderivative be used to calculate areas?) are the ones who will end up with a model that can be used to answer future questions.

From this discussion, I want to conclude that being a competent presenter of the syllabus material is only one aspect of teaching. Hopefully, teachers also encourage students to explore by themselves, and to become comfortable in the temporary confusion that is always present in serious intellectual pursuits, so they can effectively form coherent models. Exploration can be encouraged by showing the student how the course material is relevant to their own personal goals. Working with interesting problems and facing them like games can also lead to exploration. Comfort while searching for clarity can be facilitated by a humble and sympathetic attitude. Students should feel how professionals in a particular area think about problems, and realize that it is something well within their reach by working hard. Finally, teachers should not feel like life inside the classroom is categorically different from the rest of their lives. Within that room we are all people, and as it is outside that room, encouraging the well-being of those around is a great way to progress and satisfaction.