

## Teaching Philosophy Statement

I desire to inform the public of the impact science has on global enterprise and quality of life. Executing this mission creates informed citizens, while fostering creative and empowered thinking. It is important to be humble and recognize that many of the students in a general chemistry classroom do not want to become practicing chemists. However, they do want to understand the value of the course they are taking for their major and chosen profession. Equally, for those who do desire careers in science, health, or engineering it is essential to set their foundation for their long-term study. Guided by this mindset, my teaching activities at Penn State have established the three core principles of my teaching philosophy.

**Create a learning community.** I strive to see the students' needs, which may have very little to do with the course I am guiding them through. Therefore, the central task may be to open their minds to the necessity of what they are learning. This motivation is most easily achieved if the class is transformed into a learning community. This starts by learning every student's name immediately and by fostering small exchanges that humanize the students to each other (and the instructors to the students). Recitations and office hours are an essential component of this objective. I seek to maximize office hours attendance because these encounters provide a space to demonstrate the value of study groups and to model self-regulating behaviors like elaboration with peers. At the undergraduate level, supportive, high-quality role model relationships can benefit both male and female students as they make academic and career decisions. Such relationships are a predictive factor in steering women and students from under-represented groups toward achievement in science and mathematics. In a community that respects the needs of all students, respect for diversity flows naturally and learning outcomes for all included participants will be maximized.

**Lead with the concepts and the perception of value will follow.** Students often learn that chemistry is about meaningless but challenging problem solving that translates well to high-stakes testing; connecting the problems back to the concepts doesn't generally happen. In contrast, the courses I design place the concepts forward, only allowing calculations to enter later when they can be decisive between conflicting hypotheses, or when they point logically toward a deeper model. For example, the included problem set is the first of a three-week series that builds up the foundations for a thermodynamic description of chemical reactions. Students do encounter quantitative calculations, but first they develop a language and a logical framework that will guide them through all future units, and which is applicable in a variety of science courses they will encounter regardless of their major. Concept-centered instruction teaches students what they stand to gain in all subjects if they develop quantitative thinking skills.

**Learning is a process that students must achieve for themselves.** The classroom facilitator's role is to center the students in a process of learning where the classroom is one essential component of the immersive intellectual work that they are doing for themselves. Our classroom activities must generate action, with a focus on guiding students through the bottlenecks that typically constrain their advancement. In general chemistry, this is rigorously achieved by using chemical demonstrations to challenge misconceptions in prior knowledge, or to motivate the development of a new theory. Classroom assessment techniques that take very little time are a great tool because they embed scientific inquiry into the learning process. Whether with technology or simple shouting on the count of three, students can answer conceptual questions readily. Discordant responses are an opportunity to huddle in small groups where convergence on correct responses models the power of group study. Asking students to sketch a chemical model on a notecard and then revisiting their responses later in the meeting assists with identifying and deconstructing misconceptions. By engaging the students in the journey to a class meeting's conclusion, students become aware that they are capable of learning the material.