Teaching Philosophy and Interests

Wan-Ting (Grace) Chen

Summary
My teaching philosophy was molded by my education as an engineer. For me, education is significantly more than imparting knowledge found in textbooks. As an engineering student involved in a multidisciplinary research group, I had the opportunity to gain a great deal of know-hows by participating in different research activities. This experience also motivated and reinforced my teaching philosophy. I truly believe that by involving students with hands-on projects and real-world solid examples, learning new knowledge can be more effective while creative thinking and innovative solutions will be strongly encouraged. As Benjamin Franklin has said, "Tell me and I forget. Teach me and I remember. Involve me and I learn."

Teaching Philosophy

I am deeply committed to effective teaching and mentorship. I have been very fortunate to have had many positive and influential mentors during my education. This experience incentivizes and eagerly drives me to be a supportive and helpful mentor to my students. My objective when teaching and mentoring is to create a learning environment that simultaneously develops critical thinking skills and fosters an open mind to all possibilities by emphasizing the rich conceptual issues that defines sustainable energy science and engineering and how this discipline impacts our lives. By expanding not only the students' scientific understanding of engineering problems but most especially how they apply it to the real world, we can critically review more available sustainable engineering practices and/or stewardship. Advantages and limitations of the established methods would be identified during this critical thinking process, and valid alternative state-of-the-art methods can then be developed. Ultimately, I hope my students can think "outside the box" and develop their confidence in proposing solution to existing and new problems.

Teaching experience

As I have served as a teaching assistant (TA) in the class of *Transportation Phenomenon* (ABE 341), I have designed weekly worksheets for students, conducted office hours, worked with students on their lab projects, and graded homework and worksheets. Moreover, I realized that effective communication is a key element to help students understand fundamental theories (e.g. fluid dynamics) and accomplish lab projects successfully. A smooth communication can inspire students' potential and establish their confidence. For example, I always encouraged students to come to office hours and work on those difficult problems together. Textbook and homework are not something to beat them but tools to help them learn. Working as a team to solve problem sets usually can help them develop critical thinking skills and address problems more efficiently. For instance, one of my students learnt that units may help her check if the answer makes sense in a fluid dynamics problem. Additionally, I have served as a guest TA for several class projects (ABE 100, ABE 225, CEE 398 and TSM 431, please refer to my CV). As a mentor, I usually ask students some questions and give some solid examples to initiate their interest. Literature review and experimental design are generally required in class projects. Through lab projects, students can gain knowledge on bioenvironmental engineering design, particularly about biomass conversion and sustainable energy engineering, while I always benefit from the mentoring and discussion. Teaching and mentoring are not only a give-and-take process but also an interactive and mutual beneficial discussion with the mentored undergraduates at the same time.

Mentoring experience

By participating a multidisciplinary research programs in University of Illinois, joining the algae club in my home department, and involving with SWE (Society of Women Engineers) on campus, I was very fortunate to have ample opportunities to mentor or work with students from elementary school, high

school, to different levels of undergraduate students (please refer to my CV). As providing technical training and helping them develop research topics, I always benefit from the mutual beneficial discussion. Students often inspire me from a different point of view and pay more attention to details than I do. This mutually beneficial discussion has been a cornerstone of my research career. For example, when I worked with my first undergraduate, sparked by her previous experience on centrifugation, we began to develop a more sustainable pretreatment technique, combining centrifugation and ultrasonic processes, for improved bioenergy conversion efficiency from algal biomass. Another instance is that I have further advanced my knowledge on gas-chromatography mass-spectrometry (GC-MS) by instructing several undergraduate and graduate students on using this equipment for analyzing biocrude oil and volatile aqueous products—mentoring itself is an intensive learning experience.

Teaching methods

When I served as a TA four years ago, I found it was drastically different between knowing the knowledge and transferring to others. For instance, demonstrating a practice example is likely more helpful to the novice than throwing a challenging problem at him/her, which may spoil a student's interests and confidence. During my work with undergraduate students from different departments and culture background in University of Illinois, I realized that working on projects can significantly motivate students to learn a specific topic and inspire students' potential as well as establish their confidence. Therefore, I will combine lecture and lab projects in my classes. For fundamental classes (e.g. transport phenomenon and heat and mass transfer), I plan to apply in-class discussion to one of the weekly lectures with a worksheet. I will also separate students into different groups and assign different groups of students to design the worksheet every week. This type of student-centered learning method can further help students think about why the lecturer/textbook asks questions like that way and why those questions matter. For advanced classes (e.g. classes provided for senior undergraduate students or graduate students), I will combine lectures, lab projects, field trips (e.g. visit a zero energy residence building, a bio-ethanol plant, or a pilot scale continuous reactor to generate biofuels/biogas), term-paper writing, and practice proposal writing together. When I took classes and served as a TA in University of Illinois, I found out lab projects usually can make students effectively learn hands-on skills and apply what they learnt in classes to real-world problems while field trips can greatly initiate students' interest on a specific topic. In addition, term paper and practice proposal writing can help students synthesize their thoughts on specific topics and present their ideas in a professional way. For instance, when I wrote my practice proposal for *Green Chemistry* (CHEM 460) and *Polymer Chemistry* (CHEM 480), I read a lot of papers about biorefienries and reviewed different biomass conversion techniques. In the end, I gained deeper insights about renewable energy and value-added chemical production processes, which ultimately contribute to part of my PhD thesis. Furthermore, I will conduct an early feedback, which will happen in the one third or half of the semester, in my classes so that I will have time to fine tune my teaching style or adjust course content during the semester. Overall, by using versatile teaching methods and techniques, I hope to give students a great incentive to learn different levels of courses and understand how they may change and impact the world.

Courses of interest

I will be confident to give classes for both undergraduate and graduate programs in the area of Chemical/Environmental/Biological/Agricultural engineering in the University, particularly for those covering biomass conversion, renewable energy production, and green chemistry & engineering. More specifically, I can provide fundamental courses such as (Chemical) Instrumentation, Introduction to Biofuels, Statistics for Engineers & Scientists, and Modeling Biological System. For graduate level classes, I can also teach Biochemical Engineering, Green Chemistry and Engineering, Sustainable Energy System, Chemistry for (Bio)Environmental Engineering and Science.