

Joshua Pulsipher | Teaching Statement

✉ pulsipher@cmu.edu • 📧 pulsipher.info

Overview

Driven by my passion for mentoring and teaching, I actively seek out instruction opportunities and await magnifying my professorial teaching responsibilities. My teaching philosophy focuses on promoting a **growth mindset** in an **active learning** environment that is **inclusive** for all; I have refined this through experience in instructing courses on organic chemistry, process control, chemical process modeling, and advanced decision-making. I am well-suited to teach courses in chemical engineering, particularly on numerical methods, process design/control, data-science, statistics, and optimization. My expertise in data-science and decision-making under uncertainty enable me to teach graduate courses on related topics; here, I **leverage my research to innovate curriculum** at all courses levels. Finally, I will maintain a high instructional caliber via frequent student feedback, continued pedagogical training, and deliberate practice.

Teaching Philosophy

In this section, I discuss my teaching philosophy which is based on active learning, a growth mindset, and an inclusive environment; the fruits of which include **high student interaction**, satisfaction, and performance.

Active Learning

Active learning seeks a dynamic learning environment that readily **encourages student engagement**, contrary to traditional lecture-based approaches. This is key to achieving subject mastery that enables students to apply core chemical engineering concepts to diverse engineering challenges. I employ a **flipped classroom** where I cover new material via concise video lectures and use classroom time to conduct supervised learning exercises that allow students to engage in **deliberate practice**. I establish clear learning objectives based on **Bloom's taxonomy** (which defines 6 cognitive learning processes and 4 types of knowledge) to guide the development of instruction, assessments, and exercises (e.g., think-pair-share, concept mapping, and live polling). I also provide my students with a **transparent teaching vision** at the beginning of a course so they know that I will use cutting-edge teaching strategies, advocate for their success, and solicit their feedback for improvement.

Learning with a Growth Mindset

A growth mindset affirms that mastery comes with **sufficient time and effort** in contrast to the misconception that intelligence/mastery is innate which stifles progress, promotes superficial understanding, and discourages active learning. I've observed some "smart" individuals forego studying, and I've seen others drop majors thinking they weren't "smart enough" for certain prerequisite courses (e.g., mathematics). To combat these pitfalls and promote a growth mindset, I directly discuss this concept, recognize students' effort/improvement, and structure courses that **reward genuine effort** such that failures become opportunities for learning. For instance, I plan to encourage students to submit **test corrections** to regain partial credit. I also assist individual students identify effective learning strategies on which to focus their effort. This is an especially important for STEM students who are often discouraged by a barrage of challenging courses (i.e., chemistry, mathematics, thermodynamics, biology, etc.). In short, I strive to establish a classroom with the understanding that **everyone can excel** regardless of the ease at which understanding comes initially.

Inclusive Learning Environment

Inclusive learning environments allow all students (especially underrepresented groups) to **feel a sense of belonging** and to equitably receive the support they need. I strive to foster an inclusive learning environment via a **transparently inclusive teaching** style, connecting personally, determining student expectations, modeling inclusive language/behavior, providing **diverse channels of participation**, facilitating collaborative small group work, and soliciting frequent **anonymous student feedback**. I also do not tolerate any derogatory, offensive, or discriminatory comments/actions (taking swift recourse as needed). Finally, my lived experience in battling physical disabilities empowers me to ensure that all are **equitably accommodated** in my classroom and beyond.

The Interplay between Research and Teaching

Learning from some professors I've observed over focus on research to the detriment of their teaching engagement, I endeavor to use the same standard of excellence in both my teaching and research pursuits. Furthermore, I plan to

leverage my research to innovate course curriculum; for instance, I can incorporate excerpts from my research to instruct how **uncertainty/statistics** (a common weak-point for students) play an important role in the subject matter (e.g., chemical process design). This allows me to discuss areas I am passionate about and encourage undergraduate research. I can also tie my research directly into relevant graduate-level courses.

Teaching Experience

In this section, I briefly summarize the teaching endeavors I have actively pursued and highlight the application of my teaching philosophy that was refined along the way.

While attending Brigham Young University (BYU) and the University of Wisconsin-Madison (UW-Madison), I worked as a recitation leader. At BYU, I instructed discussion sections in organic chemistry and learned to **enhance my teaching through student feedback**, achieving 1st quantile grades in all sections. At UW-Madison, I led a process control laboratory section where I often accommodated students in response to unforeseen difficulties (e.g., aging equipment) to foster an **equitable learning experience for all**. I also practiced active learning techniques that helped students to significantly improve their technical writing.

Notably, at UW-Madison I took the initiative to **co-instruct a chemical process modeling course**, focusing on the computer programming course material. Here, I developed my **flipped classroom** learning structure and focused class time on active learning exercises (e.g., think-pair-share), using frequent anonymous feedback student to tailor my approach to their needs. I ultimately obtained a **94% approval** rating with comments such as *"I liked the flipped classroom style..., it was perfect for the topic. Computer programming requires practice, and he did a good job of bringing this into lecture."* This also highlights how my students were invigorated by my **transparent teaching philosophy** and internalized it. The full set of reviews are available upon request.

More recently, I **developed a short course series** on computer programming and decision-making tools (e.g., InfiniteOpt.jl) in the Julia language which I taught at UW-Madison, Carnegie Mellon University (CMU), and at an international workshop in South Korea. These received highly positive reviews and I am organizing plans to offer these courses in **Spanish** and English as part of an initiative to establish new connections with **underrepresented regions of Latin America** (e.g., Peru).

At UW-Madison and CMU I have **individually mentored** 5 undergraduate and 6 graduate researchers to develop the necessary skill-sets to make meaningful research contributions, focusing on their individual career goals and interests. This has proved effective with 8 students **co-authoring peer-reviewed journal articles** to date. As I professor, I am excited to continue mentoring and working alongside aspiring researchers.

Course Interests

With my skill-set, I am well-suited to teach any undergraduate course in chemical engineering, particularly computational tools, chemical process principles, process design, unit operations, and process control. My expertise in data-science and decision-making also qualifies me to teach related graduate courses; I can also create new graduate courses related to my research.

Continued Pedagogical Education and Improvement

I actively seek out **continued education from pedagogical theory experts**. At UW-Madison, I frequented the Delta program for professional development in teaching, mentoring, and outreach. This greatly influenced the core pillars of my teaching philosophy. At CMU, I am taking advantage of the Eberly Center for teaching excellence & educational innovation to continue my pedagogical development. Moreover, as a professor, I will take full advantage of my institution's teaching center to further refine my teaching skills. I also regularly solicit **anonymous student feedback** in my courses to proactively identify deficiencies in my teaching and target specific pedagogical concepts for improvement. Recent studies show that frequent feedback in combination with **deliberate practice** is essential to develop true mastery.