Inside and Outside: Supporting students’ learning of complex cognitive tasks and in complex learning environments

Jaclyn J. Stewart
Associate Professor of Teaching
Department of Chemistry, UBC Vancouver

A significant challenge in teaching chemistry is supporting the needs of diverse learners, which includes diversity in prior knowledge, motivation, and social identities. In this seminar, I will discuss two lines of investigation aimed at addressing this challenge, from the cognitive “inside” perspective and the learning environment “outside” perspective. First, I will discuss work using the open-source web-based platform developed at our institution, called Alchemy. Alchemy offers fully customizable learning “scenarios”, which allow for iterative and non-linear thought processes and personalized feedback. Guided by the literature on the benefits of using contrasting cases, we experimented with comparing contrasting cases with sequential cases on students’ knowledge related to organic chemistry reactions. Our results reveal meaningful differences in students’ approaches to classifying reactions following engagement with Alchemy. Then, I will take a broader view of the learning environment and discuss how classroom climate and active learning pedagogies could explain inequities in chemistry learning. Research shows that how active learning is conducted (e.g., characteristics of learning activities, social dynamics of small group work) influences students’ learning and engagement and can differentially affect students. I will discuss the tools we are developing to characterize the learning environment, students’ sense of belonging, and perceptions of classroom climate. I will compare results from chemistry courses with biology and physics. This project aims to provide nuance to the implementation of active-learning pedagogies in complex, culturally situated learning environments.